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People & the Planet

Volume 5 Number 3

RIVERS OF LIFE

Front cover: Catching fish in Bangladesh.
Credit: Jim Holmes/Panos Pictures

Left: Floating market in Vietnam.
Credit: Peter Charlesworth

People & the Planet

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Sharing our rivers

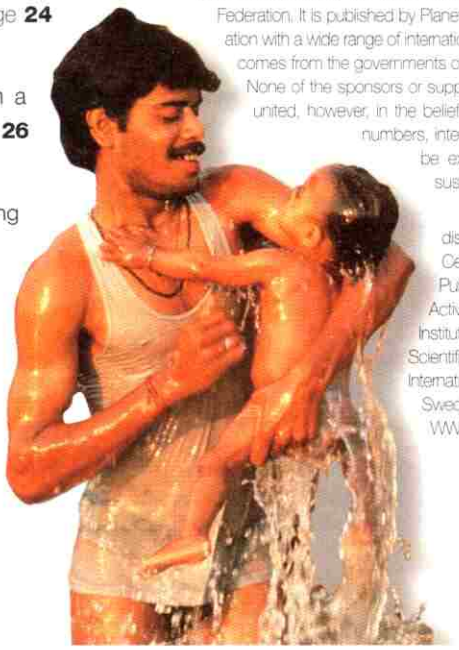
Concern over the earth's freshwater resources is now being heard from all sides. Last year we detailed the way in which lakes and inland seas, in every continent, are being polluted by mining, timber and forestry activities, by factories and farms, by the effluent and acid rain from cities and by water diversion and damming. In this issue we look at what is happening to the rivers that feed those lakes and others which find their way into the sea – or did until they were so dammed and diverted that they run into the sand, leaving delta folk to contemplate a dismal future, as Sandra Postel describes in her opening article. As always we looked to report the good practice as well as bad. Unfortunately, the warning signs are stronger than the stories of success, and our coverage reflects this reality.

Rivers are not only being polluted and dammed to provide electric power and irrigation, with tremendous human and ecological consequences, especially on local farmers and fishermen and on villagers who depend upon clean river water to drink. Their flow is being cut so that downstream users find their supply drying up. Ismael Serageldin, World Bank vice president, speaking at the recent Habitat II conference in Istanbul said that almost 200 rivers around the world cross national boundaries and 40 per cent of the world's population lives along these rivers. "Be under no illusions about this," he said, "the impact of general water shortages is going to hit our cities. In the next century wars will be fought over water."

In another recent report on *The Decline of Freshwater Ecosystems*, the Worldwatch Institute found that 20 per cent of the 9,000 known freshwater fish species are already extinct or imperilled. Our reports on the effects of dams on the Mekong and the Ganges show just what the human cost of such destruction can be.

And yet, as Biksham Gujja argues in this issue, some countries will have to increase their use of freshwater. The question is how that can be done in ways that are not environmentally damaging, and how in other parts of the world wasted water can be saved and rivers can be freed to restore valuable wetlands. How, perhaps above all, can the rivers be shared for the benefit of all? Daniel Hillel in his splendid article on the Troubled waters of Eden argues that water need not lead to war, but can be an inducement to peace. Let's hope that he is right.

John Rowley



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The following 'associates' are partners in the development and distribution of *People & the Planet*: AVSC International, Audubon, Center for Communication Programs, John Hopkins School of Public Health, Earthwatch, Center for Development and Population Activities, Family Health International, Futures Group, International Institute for Environment and Development, International Union for the Scientific Study of Population, Pathfinder International, Population Action International, Population Concern, Population Reference Bureau, Royal Swedish Academy of Sciences, Television Trust for the Environment, WWF-Alliance for Religions and Conservation.

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HELPING THE POOREST

Seven developing countries and four north European countries have committed themselves to invest more money in assistance which benefits directly the poorest nations.

The commitment, enshrined in the so-called 'Oslo-Declaration', means that the poor countries, amongst others Burkina Faso, Tanzania and Vietnam, have to adjust their government expenditure.

Aasha Amin

Twenty per cent of that expenditure is to be directed towards primary education, health care, nutrition, drinking water and population programmes. In turn, the four donor countries, Norway, Sweden, Denmark and The Netherlands are committed to make 20 per cent of their aid available for these purposes.

The agreement was reached in April at a meeting in Oslo, and follows on from the Summit for Social Development which was held in Copenhagen last year. The so-called 20/20 measure, outlined by James Gustav Speth, Director of UNDP, in *People & the Planet* (Vol 3/3 1994), was discussed in Copenhagen.

On that occasion, countries could only find agreement on a recommendation to employ the 20/20 measure. For some countries that proved to be too vague; hence the reintroduction of the subject in Oslo.

A review will take place within two years to establish whether the Oslo Declaration actually works in practice. Norway offered to prepare a follow-up conference. The Netherlands agreed to supply technical assistance to establish the reporting procedures.

The group of 11 countries which is now making a start with the implementation of the 20/20 measure may, in the longer term, be extended. A number of larger countries, such as the United States, France and Germany have indicated their interest in implementing the 20/20 principle in due course.

HABITAT VERDICT

The immediate verdict on Habitat II, the city summit held in Istanbul from June 3 to 14, must be that it was – in many respects – a surprising success, *writes John Rowley.*

Prepared with a meagre budget of $1.7 million of UN money (plus $70 million pitched in by Turkey to smarten up Istanbul and host the event) the preparatory meetings had made slow headway. As a result, the draft Habitat Agenda, or Global Action Plan to meet the massive challenges facing the world's urban settlements in the 21st century, was sent to Istanbul undigested and heavily bracketed. One respected non-governmental Forum called it "a long jargon-ridden contradictory, often unreadable, repetitive and inconsistent mass of worthy sentiments – with little mention of how it is to be achieved or supported."

But after stopping the midnight clock to finish its work, the Conference agreed on an Action Plan and Declaration which does reinforce past UN recommendations on a wide range of global issues and breaks new ground on others. This includes a qualified commitment to the right to housing, the importance of giving women an equal deal, including the ownership of land and access to inheritance and credit, and emphasis on environmental health and justice.

Moreover, the Conference itself involved for the first time a large gathering of non-official participants, ranging from mayors and city planners to engineers, architects businessmen, parliamentarians, non-government organizations, inter-government organizations and UN agencies. Together they had a significant influence on the Agenda and produced a useful second report summing up their views.

Jorge Wilheim, the Conference Deputy Secretary General, told *People & the Planet* after the meeting that its main aim – to create a partnership of actors to deal with the urban future – had been achieved. The work of Committee II of the Conference, involving the partners had, he said, been "a beautiful experience...We have let loose many forces and many actors who will not let things slip."

Others were not so sure. The disappointment of many developing countries was summed up by the Colombian delegate in the final Plenary session, when he regretted the failure of the meeting to agree any additional transfers of resources or technology to deal with the huge urban problems facing many countries of the South. And although the Habitat centre in Nairobi was named as the focus for follow-up, he like others regretted "the greater uncertainty over the future of Habitat."

Leading city commentator, David Satterthwaite, had other worries. Who, he asked, is going to monitor governments and aid agencies in carrying through the Habitat Agenda? And while that Agenda says all the right things, why is there so much emphasis on 'enabling markets' to solve the problems and relatively little about 'enabling people' to do so. He, like others, worries about just where the money will come from now that trade liberalization has downsized government, both national and local.

The answer, it seems, must lie in forging what Wilheim calls 'a new social contract', where the role of government is changed, where public institutions are not necessarily state institutions, where governments set the policy but new partnerships carry it out. That, he admits, is some way off, but he believes a start has been made at Istanbul.

WOMEN POWER

As always in UN conferences, Habitat saw the rerun of some old battles, including in this case the issue of 'reproductive health'. In a significant victory against an unexpectedly powerful alliance of right-wing NGOs and governments, including the Holy See, a coalition of women succeeded in stiffening the resolve of the conference to support not only the broad range of gender issues agreed at the UN conferences in Cairo and Beijing, but in reinforcing the importance of reproductive health.

In a key paragraph, agreed literally at the eleventh hour, the conference called on countries to: "Develop and implement programmes to ensure universal access for women throughout their lifespan to a full range of affordable health care services, including those related to reproductive health care, which includes family planning and sexual health, consistent with the Report of the International Conference on Population and Development."

Special credit for this must go to a few persistent lobbyists, including Bella Abzug, who spoke for the Women, Homes and Community Super-Coalition. The indomitable straw-hatted figure sat through late night sessions and gave endless press briefings to represent the women's network. Her efforts were rewarded not only in the outcome, but in an unusual tribute from Conference Secretary General Dr Wally N'Dow in the final late night Plenary.

The linked topic of population also emerged more strongly than many had expected. Perhaps this was not so surprising in a city such as Istanbul, which has grown from one million to 12 million since 1950, and continues to add 500,000 people to its spreading squatter settlements every year.

The latest facts were set out in the UN Population Fund's timely report on the *State of the World Population*, distributed at the meeting. Though nobody is sure of the exact figures, the report highlighted two key factors that planners will have to keep in mind. First, the inescapable reality that over 90 per cent of the 2 billion extra urban dwellers between 1970 and 2020 will be in developing countries. Second, the estimate that some 60 per cent of the growth of city populations is due to natural increase, not migration.

There are strategic lessons to be learned here, not least in terms of education and heath services, especially for women.

DISEASE SURGE

Environmental damage and poverty have fuelled a rapid increase in rates of infectious diseases in many countries over the last decade. Illness and death from tuberculosis, malaria, dengue fever and AIDS are all up sharply.

Taken together infectious diseases killed 16.5 million people in 1993, or one-third of all deaths worldwide – slightly more than cancer and heart diseases combined.

A report from the Worldwatch Institute *Infecting Ourselves: How Environmental and Social Disruptions Trigger Disease (No.129)* says the resurgence of these diseases stems from a mix of growing population, poverty, poor health care, misuse of antibiotics and severe environmental degradation.

According to the report's author, Anne Platt, "Infectious diseases are a basic barometer of the environmental sustainability of human activity. Recent outbreaks result from a sharp imbalance between human population growing by 88 million each year and a natural resource base under increasing stress."

"Water pollution, shrinking forests and rising temperatures are driving the upward surge of infections in many countries," the report says. "Only by adopting a more sustainable path to economic development can we control them."

But poverty is the deadlier disease, as the World Health Organization has pointed out, says the report. It is the main reason that babies are not vaccinated, clean water is not produced, and effective drugs are not provided.

The report calls for a four-point plan to slow population growth and stabilize the world's climate, to improve social and economic conditions, to expand coverage of basic public health measures, antibiotics and medicines and to establish a global health monitoring system.

Jorgen Schytte/Still Pictures

For copies of Worldwatch Paper 129, March '96, contact Jim Perry, The Worldwatch Institute, 1776 Massachusetts Avenue NW, Washington DC 20036-1904, USA. Tel: (+1 202) 452 1992 ext 537, or Fax: (+1 202) 296 7365.

DAMAGED LAND

Almost half of the agricultural land in South Asian countries suffers from degradation, causing economic losses of at least US$10 billion a year, says a recent United Nations report *Land Degradation in South Asia.*

The report, conducted by FAO, UNDP and UNEP, found that 43 per cent of the region's total agricultural land suffered from one form of degradation or more. The worst country affected is Iran with 94 per cent of agricultural land degraded, followed by Bangladesh (75 per cent), Pakistan (61 per cent), Sri Lanka (44 per cent), Afghanistan (33 per cent), Nepal (26 per cent), India (25 per cent) and Bhutan (10 per cent).

Jim Holmes/Panos Pictures

Interestingly, the study also assessed the economic costs of land degradation according to types of degradation: water erosion US$5.4 billion; wind erosion US$1.8 billion, soil fertility decline $0.6-1.2 billion; waterlogging $0.5 billion and salinization $1.5 billion.

According to the study, three factors are at work. The first comprises natural hazards, such as heavy rains and steep slopes that lead to erosion; soils that are strongly acidic that result in soil fertility decline and arid climates that contribute to salinization and lowering of the water table.

The second set of problems are caused by human activity. These include deforestation, overcutting of vegetation, overgrazing, improper crop rotation, unbalanced fertiliser use, mismanagement of canal irrigation and overpumping of groundwater.

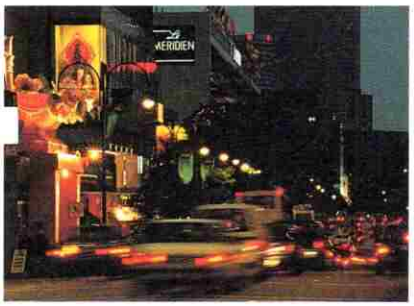
The third factor comprises what the study calls 'underlying causes of degradation'. This includes, land shortage, inappropriate land tenure agreements, severe economic pressures on farmers, poverty, and population growth.

Third World Features (1413/96).

CURBING THE CAR

Singapore's public transport system, already one of the most advanced in the world, is to receive a $14 billion shot in the arm aimed at largely eliminating the car from the island state over the next 20 years. Under a new plan, outlined in a White Paper earlier this year, the use of cars – which are already heavily taxed – will be further discouraged. Potential users will not only have to bid for licences to buy a car, but will face even tougher road tolls through an electronic road-pricing system.

How far the scheme will actually inhibit car use remains to be seen. The White Paper concedes that by 2010 one in seven Singaporeans will own a car, compared to one in ten today.



Chris Stowers/Panos Pictures

As pressure on fresh water increases, the need for co-operation between states to protect them and share them is growing. Here **Sandra Postel** reviews the global challenge and calls for a new ethic of river sharing.

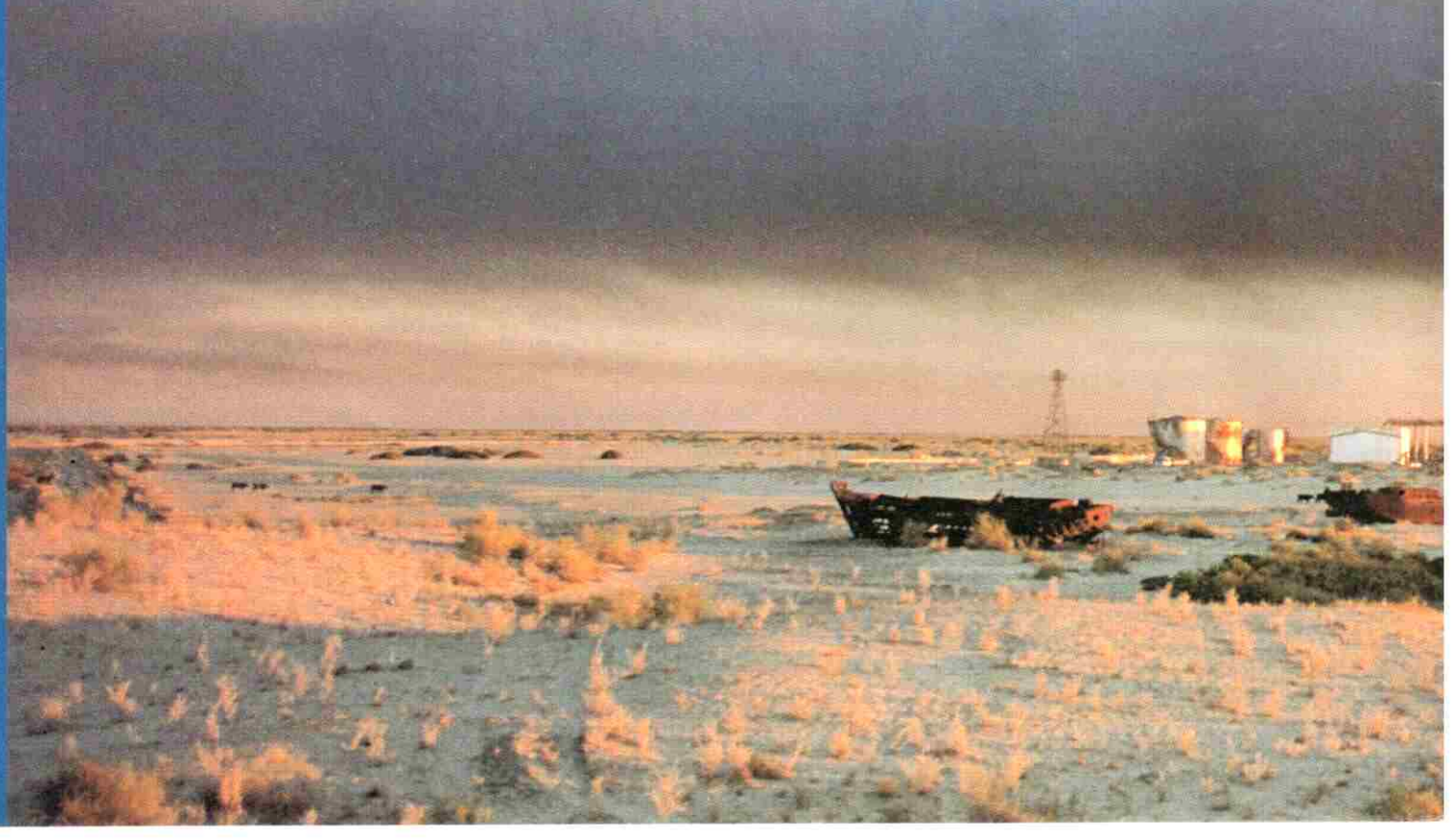
Sharing t

Just south of the US-Mexico border, the Cucapá, or "people of the river," have fished and farmed in the delta of the Colorado River for some 2,000 years. Today, they are a culture at risk of extinction.

Just 40 to 50 families remain in the delta region. There is little work for the younger tribal members, and many have migrated to the cities. Traditionally, they ate fish three times a day, but now they are fortunate to have it once a week. Since their water is too salty to grow melons, squash, and other traditional crops, their diets have become less healthy. One expert on the Cucapá predicted a few years ago that "barring a miracle, you're seeing the last of them."

The reason for the Cucapá's precarious state lies in the neon lights of Las Vegas, the cotton fields of Arizona, and the swimming pools of Los Angeles. The Colorado River, the Cucapá's lifeblood, has been so heavily dammed and diverted in the western United States that it literally disappears into the desert before it reaches the sea. Seventy-five years ago, the American naturalist Aldo Leopold described the Colorado delta as a "milk-and-honey wilderness" teeming with wildlife. But that was before more river water was promised to seven U.S. states and Mexico than the river annually carried. Today, the delta is a desiccated place of mud-cracked earth, salt flats, and murky pools.

Unfortunately, what has happened to the Colorado is but an extreme example of a disturbing and widespread decline of the aquatic environment worldwide. Globally, water use has more than tripled since 1950, and the answer to this rising demand generally has been to build more and bigger water supply projects - especially dams and river diversions. Around the world, the number of large dams (those more than 15 metres high) has climbed from just over 5,000 in 1950 to about 38,000 today. More than 85 per cent of the large dams now standing have been built during the last 35 years.

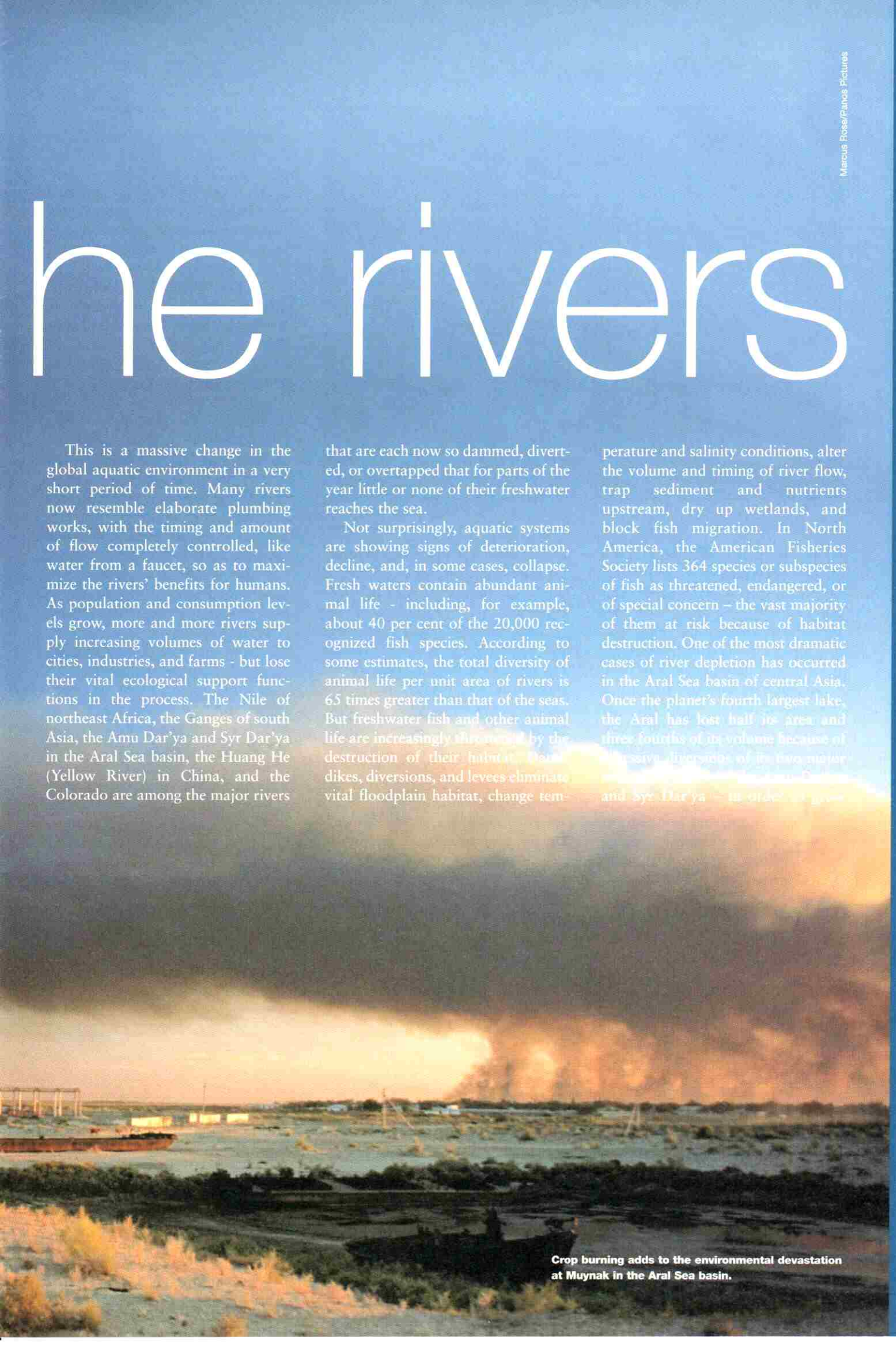


he rivers

This is a massive change in the global aquatic environment in a very short period of time. Many rivers now resemble elaborate plumbing works, with the timing and amount of flow completely controlled, like water from a faucet, so as to maximize the rivers' benefits for humans. As population and consumption levels grow, more and more rivers supply increasing volumes of water to cities, industries, and farms - but lose their vital ecological support functions in the process. The Nile of northeast Africa, the Ganges of south Asia, the Amu Dar'ya and Syr Dar'ya in the Aral Sea basin, the Huang He (Yellow River) in China, and the Colorado are among the major rivers that are each now so dammed, diverted, or overtapped that for parts of the year little or none of their freshwater reaches the sea.

Not surprisingly, aquatic systems are showing signs of deterioration, decline, and, in some cases, collapse. Fresh waters contain abundant animal life - including, for example, about 40 per cent of the 20,000 recognized fish species. According to some estimates, the total diversity of animal life per unit area of rivers is 65 times greater than that of the seas. But freshwater fish and other animal life are increasingly threatened by the destruction of their habitat. Dams, dikes, diversions, and levees eliminate vital floodplain habitat, change temperature and salinity conditions, alter the volume and timing of river flow, trap sediment and nutrients upstream, dry up wetlands, and block fish migration. In North America, the American Fisheries Society lists 364 species or subspecies of fish as threatened, endangered, or of special concern – the vast majority of them at risk because of habitat destruction. One of the most dramatic cases of river depletion has occurred in the Aral Sea basin of central Asia. Once the planet's fourth largest lake, the Aral has lost half its area and three fourths of its volume because of [illegible] diversions of its two major [illegible] and Syr Dar'ya – in order to grow

Marcus Rose/Panos Pictures



Crop burning adds to the environmental devastation at Muynak in the Aral Sea basin.

M.McEvoy/Panos Pictures

Ataturk Dam in Eastern Turkey.

cotton in the desert. Prior to 1960, the two rivers poured 55 billion cubic metres of water a year into the Aral. Between 1981 and 1990, their combined flow into the sea dropped to an average of 7 billion cubic metres, just 6 per cent of their total annual flow.

Wetlands in the Aral basin river deltas have shrunk by 85 per cent. Twenty of the 24 native fish species have disappeared, and the fish catch, which totalled 44,000 tons a year in the 1950s and supported some 60,000 jobs, has dropped to zero. Low river flows have concentrated salts and toxic chemicals, making water supplies hazardous to drink and, along with the lack of sanitation services, contributing to rampant disease. The population of Muynak, a former fishing town, has dropped from 40,000 several decades ago to just 12,000 today. The 28,000 people who have fled are "ecological refugees" in the truest sense. The Aral Sea disaster shows vividly how damage to economy, social stability, and human health can follow close on the heels of ecosystem destruction.

As water supplies increasingly fall short of needs, competition for water is increasing not only between the human economy and the natural environment, but between and within countries. A new politics of scarcity is emerging as farms and cities, states and provinces, and neighbouring countries compete for a limited or shrinking pool. Three principal forces conspire to make water scarcity a potential source of conflict: the depletion or degradation of the resource, which shrinks the 'resource pie', population growth, which forces the pie to be divided into smaller slices; and unequal distribution or access, which means some get larger slices than others.

Much of the tension and strife over water scarcity to date has occurred within countries, but the potential for hostility or conflict between countries exists as well. Unique among strategic resources, water flows easily across political boundaries. Many countries depend on river water from upstream neighbours for a substantial portion of their surface supplies. Particularly in the face of population growth and rising water demands, these countries can become highly vulnerable to decisions by upstream countries to siphon off more water for themselves. According to Thomas Homer-Dixon of the University of Toronto, co-director of the project on Environmental Change and Acute Conflict, the evidence suggests that "the renewable resource most likely to stimulate interstate resource war is river water."

River basins most likely to be hot spots for hostility are those in which the river is shared by at least two countries, water is insufficient to meet all projected demands, and there is no recognized treaty governing the allocation of water among all basin countries. Examples of such potential hot spots include the Ganges, the Nile, the Jordan, the Tigris-Euphrates, and the Amy Dar'ya and Syr Dar'ya.

Egypt may be more vulnerable than any other country to a reduction in river water flowing into its territory. The nation depends on Nile water for 97 per cent of its surface supplies.

With a population of 60 million climbing by 1 million every nine months, some 2.5 million hectares of cropland totally dependent on irrigation, and a current water demand that is very near the limits of the total supply, any cutoff of Nile flow would be highly disruptive, if not disastrous. Until recently, Egypt was at minimal risk of suffering such reductions, except, of course, from drought. But Ethiopia, which controls 86 per cent of the Nile's total flow, is now intent on developing water resources for its own economic advancement. If Ethiopia were to use Nile water to irrigate even half of its potentially irrigable area, flows downstream to Egypt could be reduced by some 9 billion cubic metres per year – equal to 16 per cent of Egypt's current annual Nile supply.

When downstream countries are relatively less powerful than water-controlling upstream countries, conflict may be unlikely, but social and economic insecurity – which, in turn, can lead to political instability – can be great. For example, as the weaker riparian, Bangladesh will almost certainly not choose to go to war with India over the Ganges. But the nation suffers greatly as the last in line to receive the river's water. Likewise, Syria and Iraq remain vulnerable to Turkey's massive dam-building upstream on the Euphrates River.

Achieving more sustainable patterns of water use and restoring and maintaining the integrity of river systems is going to take the deployment of new technologies, policies, and management strategies. More effective water pricing and water marketing, for example, can create incentives to use water more efficiently and to allocate it more sensibly. Along with the setting of water-efficiency standards, such incentives can encourage greater use of the brace of conservation technologies that are on the shelf, but underused.

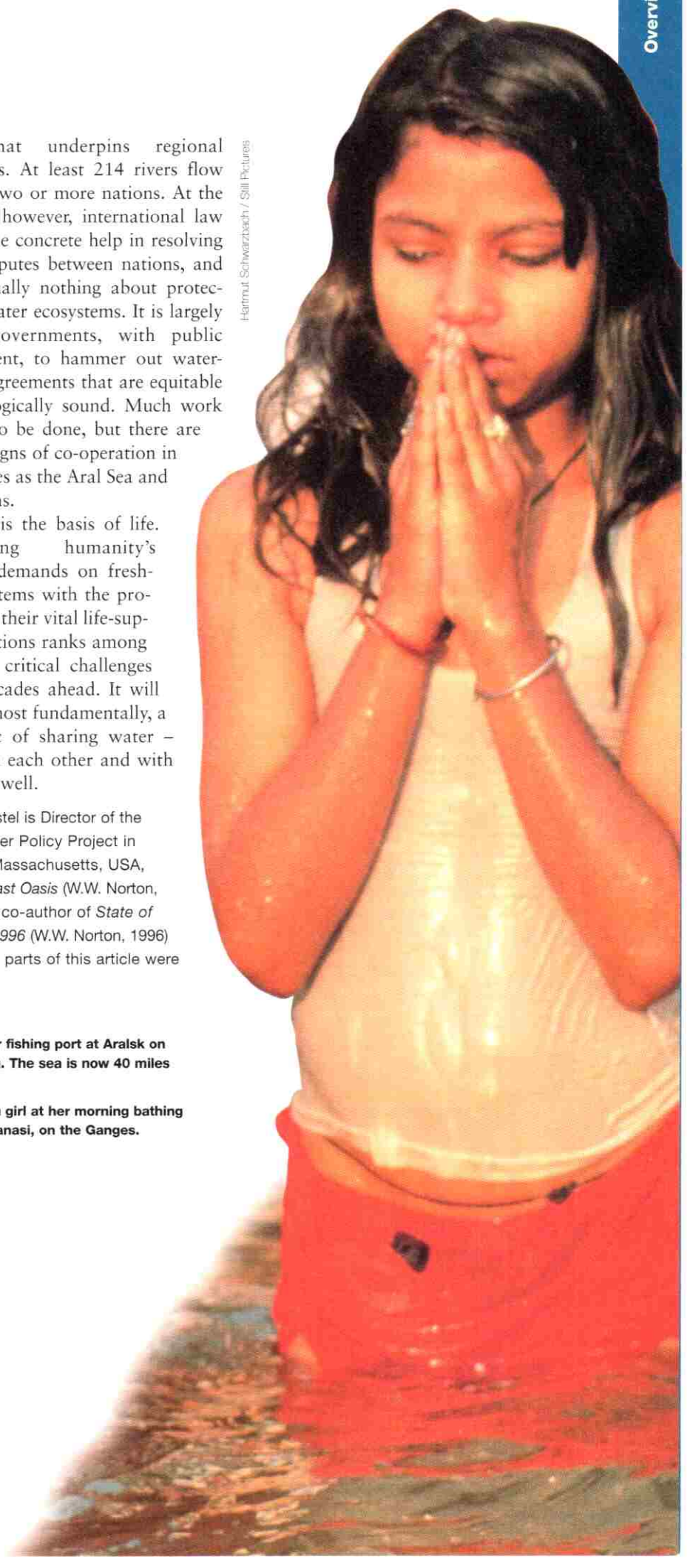
Greater co-operation both within and between countries is also urgently needed – not only to avert conflict, but to protect the aquatic environment that underpins regional economies. At least 214 rivers flow through two or more nations. At the moment, however, international law offers little concrete help in resolving water disputes between nations, and says virtually nothing about protection of water ecosystems. It is largely up to governments, with public involvement, to hammer out water-sharing agreements that are equitable and ecologically sound. Much work remains to be done, but there are hopeful signs of co-operation in such places as the Aral Sea and Nile basins.

Water is the basis of life. Reconciling humanity's growing demands on freshwater systems with the protection of their vital life-support functions ranks among the most critical challenges in the decades ahead. It will require, most fundamentally, a new ethic of sharing water – both with each other and with nature as well.

Sandra Postel is Director of the Global Water Policy Project in Amherst, Massachusetts, USA, author of *Last Oasis* (W.W. Norton, 1992), and co-author of *State of the World 1996* (W.W. Norton, 1996) from which parts of this article were drawn.

Left: Former fishing port at Aralsk on the Aral Sea. The sea is now 40 miles away.

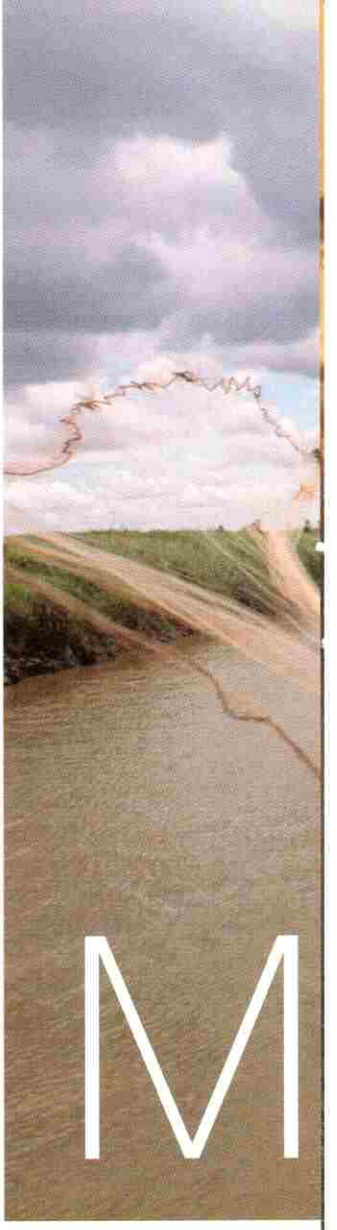
Right: Hindu girl at her morning bathing ritual in Varanasi, on the Ganges.



Hartmut Schwarzbach / Still Pictures

Steve Percy/Panos Pictures

The 4,200-kilometre Mekong River is the life-blood of Southeast Asia. Fed by melting snow on the Tibetan Himalayas and by monsoon rain, the river nourishes millions of lives from Southern China, Burma, Laos, Thailand, Cambodia to the delta in Vietnam. Today only a small percentage of the Mekong flow is regulated by dams. But the pace of hydropower development in the region is accelerating. Cascades of 30 dams have been proposed on the mainstream with another 200 sites identified on tributaries. An example of how people, fisheries and riverine ecosystems may be affected can be seen at the newly-completed Pak Mool Dam on the Mekong's largest tributary in Thailand. **Nantiya Tangwisutijit** reports.



Must the M

At 66, Suthep Promyothin is very proud of being dubbed "the water butterfly of the Mool River". It is the name village folk give him for his swift expertise in his fishing boat. He knows the water, rocks and rapids where fish seek shelter.

Suthep started travelling up and down Thailand's major rivers when he was a boy of 15. He finally settled along the Mool River in the Northeast because of the abundance of fish and the economic opportunity it has offered him. "But I fish with morality, never catch more than I need," he says.

If the Mekong is a royal river in terms of biological diversity, the Mool, which literally means "primary heritage", is close to the throne. Over 800 km long, it has been well fed by the mother Mekong for time unknown. Or so it used to be.

Everything has changed since 1992 when the Electricity Generating Authority of Thailand (EGAT) started blasting and re-routing the water channel for construction of the 136-megawatt Pak Mool Hydro-electric Dam at the mouth of the Mool River, about seven kilometres before it flows into the Mekong. Today, even at the peak of fishing time from May to July, the Mool is no longer full of migratory fish from the Mekong.

"Fish are wise and sensitive creatures," says Suthep. "The dynamite not only killed them, and destroyed their shelter and feeding areas, but its toxins also kept fish from the Mekong from migrating to feed and spawn into the Mool."

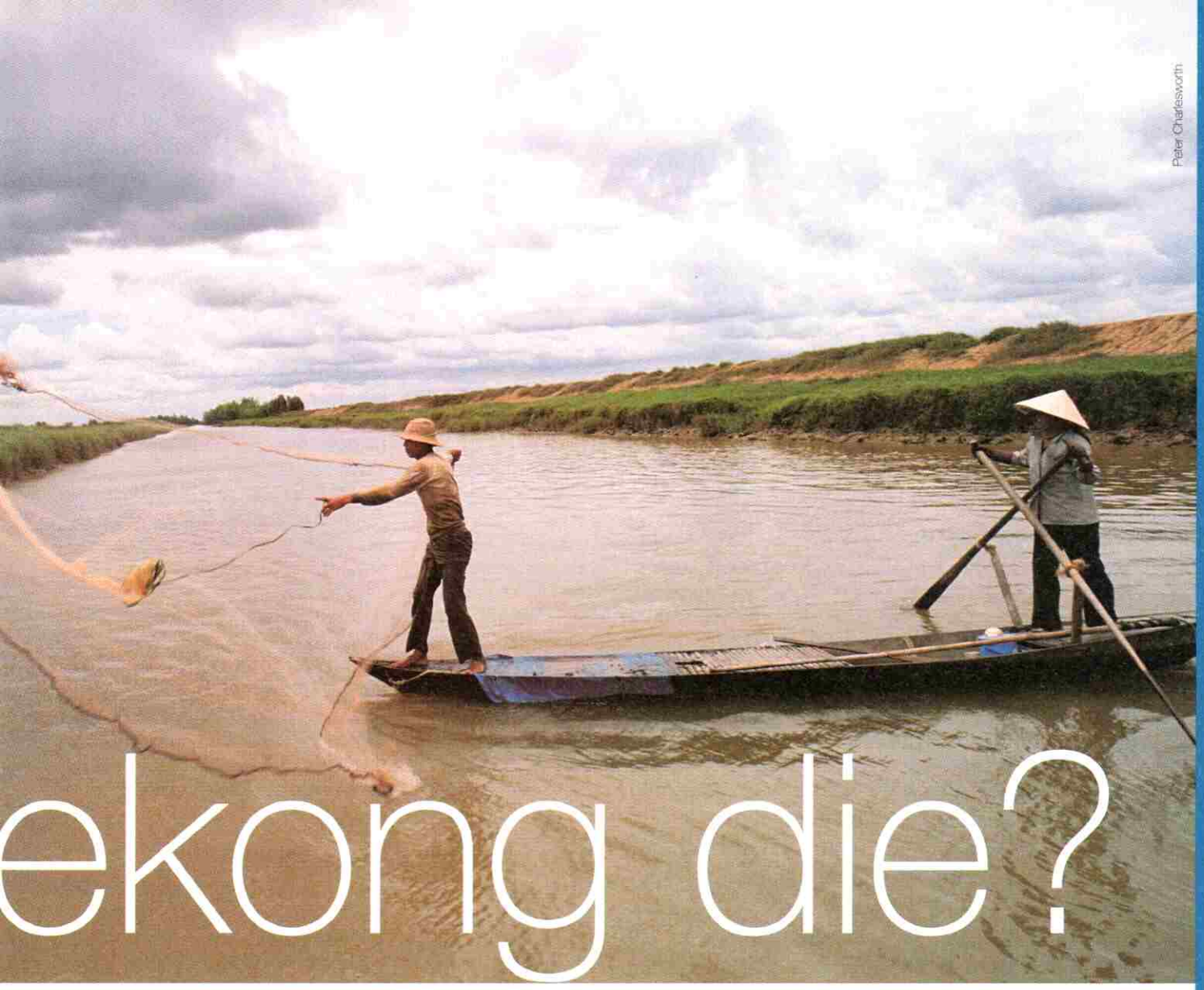
Local fishermen believe most of the fish travel seasonally between Southeast Asia's largest freshwater lake of Tonle Sap in the heart of Cambodia, the spectacular Khone Falls in southern Laos and the Mool River in Thailand. The route is also occasionally used by river dolphins.

When the World Bank-funded dam completely blocked the river in 1994, over 5,000 fishing families in three districts lost nearly all of their food and income sources. Their earnings dropped more than ten-fold, from about US$4,000 to only $350-400 a year.

First designed during 1970s by American engineers as one in the Mekong dam series, the Pak Mool project was scaled down to be a run-of-river type, which, engineers say, is more environmentally friendly than the original plan. But in the face of criticism that a 17-metre structure is still a high dam, EGAT installed a fish ladder to help migratory fish cross the dam.

Fisherfolk's immediate response when learning about the ladder was: "How can fish climb a ladder?" Then they joked: "Thai fish don't jump." The dramatic decline of wildcapture fisheries from the Mool River during the past few years showed that the villagers' observation was right.

"A few small fish and fingerlings are occasionally seen jumping over the steps," noted a villager living near the dam site. "But those big ones cannot make it. Some fish crushed their heads when they smashed into the concrete. I am sorry for them. I don't



Peter Charlesworth

ekong die?

feel like catching fish anymore."

Fish ladders are a device widely built for dams on North American rivers to help salmon cross when the fish migrate from the sea to spawn in the rivers. But ichthyologists agree with the villagers that the technology, designed for a few temperate fishes, does not work in tropical rivers with diversified fish such as those found in the Mool and the Mekong, where up to a thousand species exist.

From a two-decade study of fish in the Mekong ecosystem, Dr Tyson Roberts, from the Smithsonian Tropical Research Institute, warns: "important migratory fish species are going to disappear from the Mool River because of the Pak Mool Dam."

People's struggle

As I write this story in April, 1996, over 3,000 fishermen and women who have lost their livelihoods from the Pak Mool Dam are still sitting in weeks-long protest in front of the Government House in Bangkok. Despite the lack of shelter, tropical downpours and lack of proper food, they vow not to give up until their demands for fair compensation for the loss of fisheries are met.

The protest is actually part of the villagers' continuing struggles from 1991 to save the free-flowing river and its biodiversity that supports them.

It includes demonstrations by over 2,000 families who fought to keep their homes and farmlands.

Unfortunately, instead of applying energy-saving measures, the Thai government looks to the Mekong as a future source of cheap power to feed industrial demand which grows by 1,200 megawatts each year. And that means more dams, reviving ideas which go back over 40 years.

Green light

Plans to generate 23,300 megawatts from the mainstream Mekong during 1950s by the Mekong Committee, a UN-founded organization to co-ordinate the Mekong development by Thailand, Laos, Cambodia and Vietnam, never materialized due to decades of political and social upheaval.

The new era for the Mekong hydropower dawned in 1992 with the signing of a peace agreement in Cambodia and the lifting of US-led embargoes on aid and investment. As recommended by its Norwegian energy consultant, Norconsult International, the Asian Development

Main Picture: Illegal fishing near a crane sanctuary, Tram Nong, Vietnam.

Below: Fish ladder at Pak Mool Dam.

Peter Charlesworth

Bank (ADB) has identified 54 hydropower projects as high potential for economic development of the six riparian Mekong countries (including China and Burma).

One of the projects, on the Mekong tributaries in Laos, was for a 210-megawatt dam at Nam Theun Hinboun. But construction of the upper dam, Nam Theun 2, has not begun due to controversies surrounded the project. The proposed dam would inundate a large area of primary forest in Nakai Plateau, a habitat of 17 internationally endangered species including the black gibbon, clouded leopard, sun bear, tiger, elephant, gaur and the Vu Quang ox, a species newly identified in 1992.

Nevertheless, Laos remains at centre stage of hydropower development. On the advice of the World Bank, the Lao government hopes to raise US$25 billion in foreign capital for investment in up to 58 dams on Mekong tributaries over the next 15 years. Both the World Bank and ADB see Thailand as a major market for most of the power to be generated in Laos.

Mainstream dams

Meanwhile, the plan for grandiose mainstream dams from the 1950s was dusted off in 1994 when the Mekong Secretariat, the technical arm of the Mekong Committee, released a report which proposed a cascade of 13 run-of-river dams along the 2,400-km lower stretch of the basin from Chinese border to the delta in Vietnam.

With funding from UNDP and the French Government, consultants from Canada and France carried out the studies based on previous large storage dam projects of the committee. The stated purpose of the report was "to determine to what extent viable hydroelectric power developments might be considered on the Lower Mekong River if the scale of development is deliberately constrained to avoid or to minimize impacts."

Of the 13 projects listed in the report, nine sites with a total capacity of 14,000 megawatts were selected by the consultants as "showing the greatest promise". Five projects are in Laos, two in Cambodia and the last two on the Thai-Lao border.

Soon after the report was released, Dr Phil Williams, president of the Berkeley-based International Rivers Network, a group advocating "wise management of freshwater resources", criticized it in his technical review: "No assessment of cumulative ecological and hydrological impacts is included in the study. The impacts of this plan, with its numerous large-scale projects will certainly not remain isolated and independent."

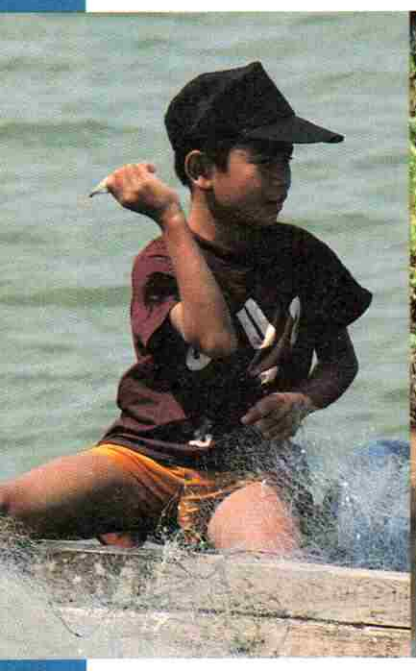
Lessons from the Pak Mool Dam in Thailand suggest that certain impacts on the environment and fisheries would be repeated on the Mekong. The dam structures would block migratory species from travelling up and down stream as well as between mainstream and tributaries (even with fish ladders). Wetlands or seasonal flooded forests would be forever inundated, destroying fish spawning and nursing habitats.

The nine dam projects would inundate an estimated 1,900 square kilometres of land and displace 65,000 people. Despite being "run-of-river" designs (with outflow generally equalling inflow), most of these dams would create extensive reservoir pools in low flow season. In some cases, back water areas would extend upstream to the next dam project.

Ichthyologist Roberts notes: "Impacts of two or more projects are likely to be multiplicative rather than mere additive. If several projects are built, the combined negative impact on fisheries and other environmental features could be as great or greater than that of a high dam with an enormous reservoir."

Downstream politics

On the surface, hydropower development in the region seems to have a promising future with the re-emergence last year of the Mekong River Commission (MRC), which replaced the Mekong Committee. The mandate of the new commission is to ensure co-operative water use throughout the Mekong River.



However, the spirit of 'co-operation' has not been much in evidence so far. While UNDP-led donor organizations would like to see the upper basin countries, China and Burma, included in the commission, Thailand does not wish to lose its status of "big brother" to China. Being the richest nation among the four, Thailand dominates decision in the MRC.

Laos, Cambodia and Vietnam do not trust Thailand's plan to divert water from the Mekong to irrigate its drought-stricken Northeast. At the same time, they also look at the cascade of 15 hydropower projects on the Mekong stretch in China with "caution".

Being unable to express its concerns officially, Vietnam turns to the press, explaining that as the last country in the basin, Vietnam worries that the projects upstream would ruin its "rice bowl" and the lives of over a million farmers in the Mekong Delta.

As Thailand is Laos' major, if not sole, market for its hydropower, Vientiane has not openly expressed concern over Thailand's diversion scheme, although the project is seen as a threat to Laos' plan to develop its navigation potential in the Mekong.

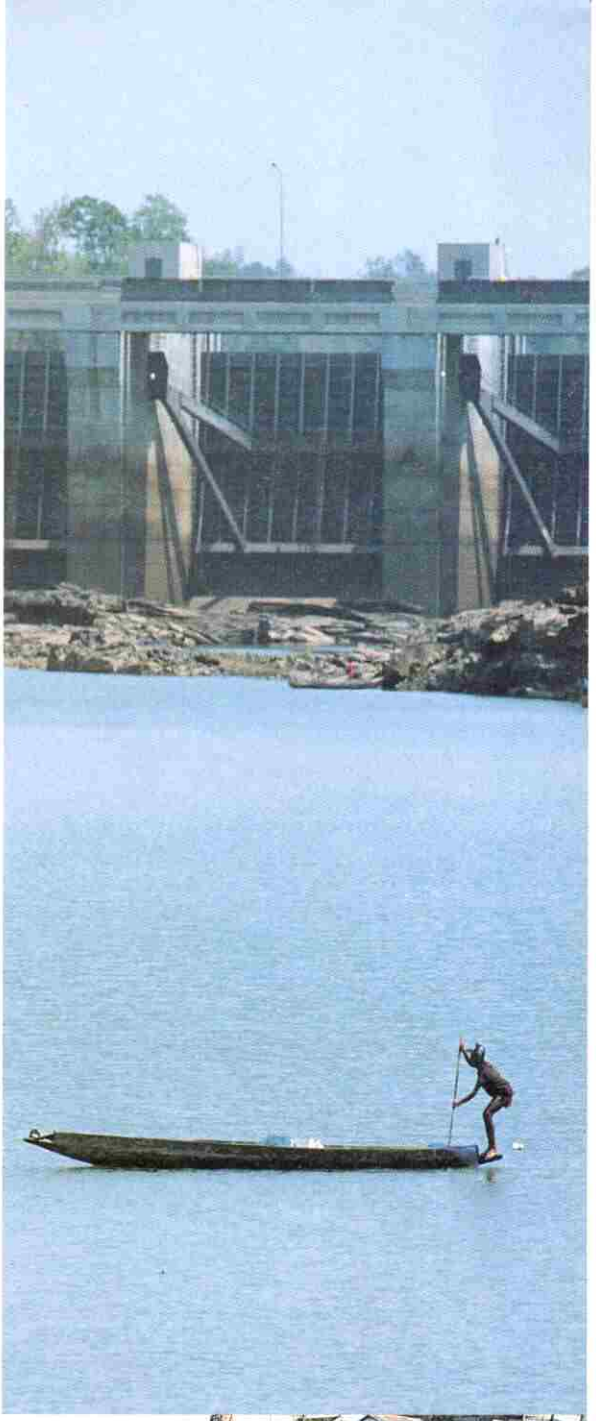
In Cambodia, the biggest concerns is the ecological degradation of the Great Lake, which is the country's major fisheries resources. Five per cent of Cambodia's income is from the fish export industry and over 60 per cent of inland fish for local use and for export comes from the Great Lake.

The Ministry of Environment in Phnom Penh is worried that the regulation of the Mekong floods would lead to a reduction in water as well as biodiversity supply to the lake.

Although the Mekong supports the lives of so many people, those people have never been allowed to participate in voicing how they would like to see their river developed. The Mekong is in the hands of a few people in governments and dam building industries.

"Take away too much hydropower and a river will die," Roberts remarks. "What is left that is 'run-of-river' only looks like a river because it still flows within the old channel or what used to be a river."

Nantiya Tangwisutijit covers social and environmental issues for the Bangkok-based English language daily, *The Nation*.



Right: Pak Mool Dam. (Peter Charlesworth)

Below left to right:
Catching the remaining small fish near Pak Mool Dam. (Peter Charlesworth)
Canals of the Mekong are the roads of the delta, Vinh Long, Vietnam. (Jim Holmes/Axiom)
Rice paddy in the Mekong Delta. (Peter Charlesworth)
Floating market, Vietnam. (Jim Holmes/Axiom)

Spirit of the waters

Julio Etchart / Reportage / Still Pictures

Local communities of Amazonian Indians are increasingly threatened by mining, damming and farming activities which are polluting their traditional fishing grounds. Here **Regina Scharf** tells the story of one group of Indians who have been helped to fight for their rights.

A well-known Brazilian Indian legend tells how Yara, the prettiest woman that lived in the Amazon, used to disdain all her admirers, to be free to spend her time by the river bank. One day, at sunset, while bathing, she was surrounded by a group of strange men, with large beards, heavy clothes, boots and hats. They spoke a mysterious tongue and seemed aggressive. Yara was raped and thrown into the river.

The Spirit of the Waters, sorry for her, transformed her into a curious entity: human, above the waist; fish, below. She lived forever, talking to birds and fish, and singing irresistible songs. The siren holds in her arms those who dare approach her, attracted by her voice. Then, she pushes the miserable man to the depths of the water, from whence he will never return.

Yara's tale is a metaphor for the dilemma of the Amazon basin: wherever technology and so-called progress arrive, Indians and forest peoples lose their rivers, their source of life.

The invasion of miners, major hydroelectric projects and commercial fisheries developed in the region during the last two decades are compromising the main source of protein of the Amazon communities. Despite the amazing volume of its water, the Amazon river, and other Brazilian rivers, are facing serious threats, and local authorities seem to be unwilling or unable to conserve its resources.

Progress and its consequences may reach even the most preserved sanctuaries. Created to protect 17 different native tribes that live in the southern borders of the Amazon, the Xingu Park is no longer secure.

Starting in 1990, the Suyá Indians realized that the waters of the Suiá-Missu River, on which their village is located, had become muddy and frequently showed oil stains. Their sole source of drinking water and fish, the basis of their diet, was in peril, and they could not understand why.

Worried about their decaying water quality, the Indians finally decided to investigate by themselves. Five Suyá and the director of the local National Indian Foundation post navigated up the Suiá-Missu to the Jaú rural estate, one of the biggest cattle ranches in the region. There, they discovered dredgers removing sand from the Daro River, a tributary of the Suiá-Missu.

The ranch manager informed them that his men were deepening the riverbed to drain the swamps along its course, in order to increase the available area for pasture. Complaining about the initiative, the Suyá were informed that the work would take another year. Some months later they realized that the river pollution was decreasing – unfortunately, this situation did not last.

The Indians were told that the ranchers had temporarily interrupted their activities. In September, 1994, they returned to the farm. This time, the Suyá were accompanied by some of their neighbours, the Txikão and Kayabi, since the pollution had spread to the waters of the Xingu River, the main water source for these groups. The commission asked for new explanations, especially since a year had passed, but the digging had continued.

The manager alleged that the project had been delayed, since the machines had broken down, and promised to finish within three months. The Indians became angry and again argued that the situation was compromising their health, the water was too dirty for consumption.

In order to distract their attention from the problem, the farm manager offered them 3,000 litres of fuel, which would allow them to get clean water in other rivers, far from their villages. Once again the Suyá went back home, in the belief that the problem was already half solved. Ten months later, the Suyá recognized that they had been deceived again, for the Suiá-Missu was still polluted.

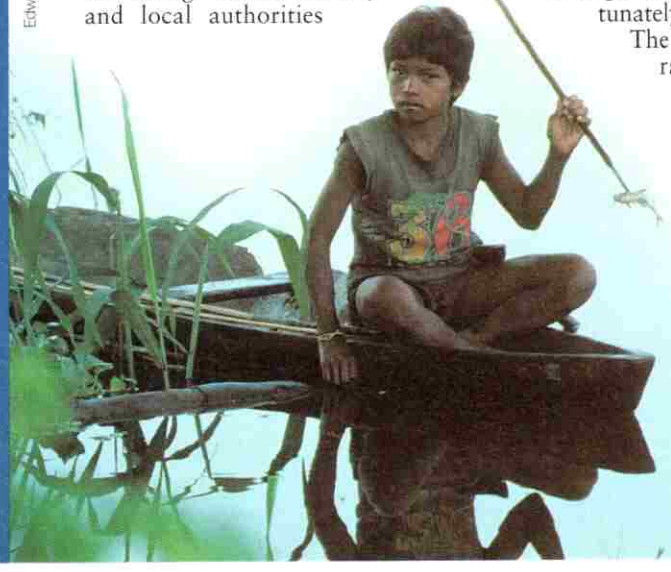
Finally, last year, a group of Suyá leaders contacted local and federal environmental authorities, helped by a national NGO, the Instituto Socioambiental, which specializes in the defence of Indian rights. As a result, the ranchers were fined twice, and forced to halt the irregular works.

The Suyá story shows, in small scale, what many Brazilian Indian tribes undergo. Nevertheless, the main damage results from the large dams constructed in the Amazon basin over the last 20 years.

In 1982, for instance, the construction of the Balbina hydroelectric plant, near the Venezuelan border, on the Uatumã River, required the transfer of two groups of the Waimiri-Atroari tribe. Part of their land – 200 square kilometres – was submerged under the lake that feeds Balbina. Since then, it has become impossible to fish in the putrid waters of the Uatumã.

Three thousand Wai Wai Indians, that live by the Jatapu River, have problems similar to their neighbours, the Waimiri-Atroari. Their territory hosts the Jatapu power plant, whose construction began in 1992. The waters are dammed just above the point where the Indians live and fish, but they soon became acidic, due to the putrefied organic matter produced by the immersion of vast areas of forest.

This contamination may reduce the quantity of fish, that are also menaced by the lowering of the water level. Navigation is impossible in times of low



Edward Parker / Still Pictures

Left: Pollution caused by gold mining.

water, and fish became easy prey to birds. Unable to travel to the nearest villages, the Wai Wai are giving up the idea of selling their excess production.

Mercury is the other major enemy of the rivers. Most of the tributaries of the Amazon are contaminated by the effluents from mining activities. Some studies indicate more than 1,800 contamination points in the Brazilian Amazon.

The American scientist Bruce Forsberg, studying mercury contamination, detected the highest levels ever found in the Amazon among people that live close to the Colombian and Venezuelan frontiers. The researcher, who works for the Amazonian Research Institute (Inpa), identified an average of 75 parts per million of mercury in hair samples, comparable to those registered in the Minamata bay, in the 1950's, after an industrial accident that killed hundreds of Japanese.

Another extensive study sponsored by the NGO Fundação Mata Virgem, to evaluate the extension of mercury contamination among Indians living in mining areas, identified a high incidence of the metal in the blood, urine and hair of both miners and natives.

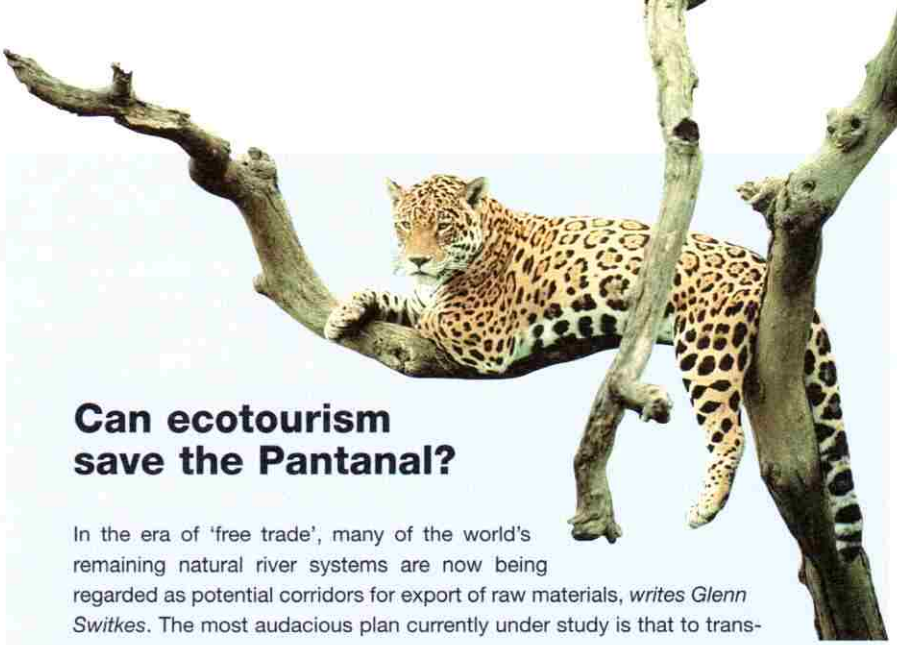
This study involved 346 people living in the lands of the Kayapó Indians, near the same Xingu Park where the Suyá live. The most remarkable conclusion was that, while 100 per cent of the natives were contaminated, only 83.1 per cent of the miners were affected, even including those that directly inhale the metal emanations. The Indians are more tragically affected because they ingest organic mercury, known to be highly toxic, and to disturb the neurological system, through their diet: basically fish.

These stories, and mainly that of the Suyá people, illustrate the importance of opening a dialogue among local communities, together with state authorities and NGOs, in order to avoid the worst ecological and social impacts of development. Only this kind of alliance may guarantee the conservation of the fragile equilibrium of the Amazonian rivers.

Regina Scharf is editor of the monthly journal *Parabólicas*, published by the Instituto Socioambiental.

Mining effluent pouring into the Amazon.

Julio Etchart / Reportage / Still Pictures



Y.J. Rey-Millet / Still Pictures

Can ecotourism save the Pantanal?

In the era of 'free trade', many of the world's remaining natural river systems are now being regarded as potential corridors for export of raw materials, *writes Glenn Switkes*. The most audacious plan currently under study is that to transform 3,400 km of the Paraguay and Parana rivers of South America into a channel for barge traffic (see *People & the Planet* Vol 5/1 and 4/2). Studies have indicated the project could threaten the survival of the world's largest remaining wetlands, including those of the Pantanal and Chaco, jeopardizing the well-being of traditional populations of the region.

Clearly, plans for large-scale engineering works in part are a consequence of the lack of practical alternative development proposals for the region. Non-governmental organizations are looking at ways by which development on a human scale can respond to the needs of the people of the upper Paraguay and Pantanal and Chaco wetlands without destroying the natural systems on which they depend.

Traditional riverine populations of the region include indigenous peoples, such as the Chamacoco, Kadiweu, Guato, and Terena, as well as mixed-blood descendants of former slaves. The principal economic activity for most river dwellers is fishing. The few detailed studies that have been carried out examining the survival strategies of local populations indicate that this is managed in a sophisticated way, with curtailment of activities during the spawning period between November and January.

Traditionally, fish were speared or caught using bow and arrow or stunned using toxic plants like *timbó*. Now, hook and line fishing is most common, for species including the *pintado*, *dourado*, or *pacu*. Though fishing with nets is prohibited in many areas, commercial fishing boats often use this method.

As in the Amazon, sustainable extraction of plant and animal materials is an important income source. Studies of economic activities of *pantaneiros* show that many extract plant fibres for basketmaking, or make carpets of floating plants called *aguapé*.

The *bocaiuva* fruit is used for ice cream, and its seed for cooking or cosmetic oils. The *guavira* is an ingredient for liqueurs. *Pequi*, a fruit similar to the persimmon, is commonly found in the savannah region, and is widely consumed. Indigenous groups like the Guarani traditionally collected *erva mate*, today widely consumed throughout the southern part of the continent.

A one-day visit to the Pantanal will provide a view of more wildlife than a tourist in the Amazon might experience in a month, due to the lack of tree cover. Ecotourism is a much discussed economic alternative for the region, given its potential for providing jobs for boat pilots, tour guides, and sellers of live bait for fishermen. However, the impacts of tourism on an expanded scale will have to be carefully assessed.

Even more controversial is cattle ranching. The largest herds of cattle in Brazil are found in the Pantanal. Whether ranching is a natural vocation for the wetlands, or whether it promotes social inequities, as well as environmental consequences, is still a matter for debate.

The challenge is to convert the crisis posed by the Hidrovia into an opportunity, where alternatives can be demonstrated on the ground before political decisions to irrevocably alter the natural river system are taken.

Glenn Switkes is Director of the Latin America Program of International Rivers Network, based in Mato Grosso, Brazil.

Troubled waters

Jorgen Schytte / Still Pictures

News reports from the Middle East conjure up a baffling succession of religious, ethnic and political problems, leading to violent conflicts. But says **Daniel Hillel**, the underlying environmental cause of the region's woes, especially its growing need for fresh water, is often overlooked.

The Middle East is in the throes of an environmental crisis. Everywhere, the traditional village-based mode of life is undermined by the degradation of basic soil, water, and vegetative resources: erosion of rainfed farmland and overgrazed pastures, salination of irrigated valleys, denudation of natural vegetation, as well as pollution and depletion of surface and underground water resources. These processes are exacerbated by the runaway rate of population growth. Consequently, millions of people, driven off the land, migrate into cities that lack essential infrastructure and offer few prospects for productive employment.

Thus caught up in a seemingly hopeless situation and disillusioned with modernity, some of the region's dispossessed become vulnerable to the blandishments of extremists. The latter tend to promise simplistic solutions: a return to an imaginary golden age, attainable by a rejection of modernity or by violence against demonized enemies. The majority of the people, however, are tired of conflict and yearn for constructive ways to apply their energies and talents toward a better future for them and their children. No mere diplomatic or political formula can provide a lasting solution to this quandary unless it addresses the complex environmental circumstances that gave rise to it.

At the core of the problem is the issue of fresh water. For, although some of the countries of the Middle East are oil-rich, nearly all are water-poor and getting poorer, due to insufficient supplies and inadequate quality, as well as to entrenched but inappropriate patterns of use. Most of the region's waters do not lie in the exclusive domain of one country or another but run across hydrologically arbitrary boundaries. Hence most of the countries cannot wrest additional supplies to answer the needs of their burgeoning populations without encroaching upon the resources of their neighbours.

Troubled waters abound in the Middle East. Rivalries over water are endemic, but they are not insoluble. Indeed, the common need for water provides a challenge and an opportunity for regional cooperation that can result in a net gain for all. The two mutually reinforcing courses of action that must be followed by all countries are augmentation of water supplies and – simultaneously – improvement of water use efficiency. The necessary action can be more effective if carried out conjointly.

The twin rivers

The Tigris and Euphrates have their common origin in the highlands of Eastern Anatolia in Turkey, where they receive abundant amounts of rain and snow. From there the Tigris flows directly to Iraq (only skirting Syria's north-eastern corner), while the Euphrates flows through Syria for several hundreds of kilometres before reaching Iraq. The Euphrates and its tributaries are Syria's major water source, on which rests that country's main hopes for increasing agricultural production to an extent commensurate with its population growth.

Syria, however, may lose up to 40 per cent of its supply from the Euphrates when Turkey completes its Southeast Anatolia Project. That ambitious project consists of a series of dams on the headwaters of both rivers, aimed at generating electricity and allowing the expansion of irrigation in the least developed part of Turkey. Iraq, further downstream and affected by both Turkish and Syrian withdrawals, may lose as much as 80 per cent of its inflow from the Euphrates. Though the Tigris provides an option for increased Iraqi use, it too will be limited by the projected impoundments by Turkey.

The claims and counterclaims of the three countries are presented as mutually exclusive. Upstream Turkey adheres to the doctrine of "absolute sovereignty" over the water resources originating in its territory, just as do states with oil resources. Downstream Iraq bases its case on the rivers' "natural

# of Eden

Mark McEvoy / Panos Pictures

Above: Ataturk Dam in Eastern Turkey.

Left: Traditional feluccas on the Nile.

course" as well as on its "historical rights" to waters that had been used by the people of southern Mesopotamia since the dawn of civilization there six millennia ago. Midstream Syria makes the same claim toward Turkey, but the opposite claim toward Iraq.

This tri-state rivalry is further complicated by a militant faction of the Kurds, a proud and ancient nation whose traditional homeland encompasses the headwaters of the twin rivers but which has thus far been denied territorial independence. As far as the Kurd separatists are concerned, the Turkish water development project is a usurpation of Kurdish land and water, and they have been fighting to thwart it.

None of the festering disputes in the Tigris-Euphrates basin has been resolved. Nor is there yet any mechanism, such as an international river basin commission, by which to negotiate and an equitable resolution. As matters now stand, Turkey can proceed with its plans simply because it is, economically and militarily, the dominant power. This balance of power, however, may be tenuous, while the problem continues to fester.

Waters of the Nile

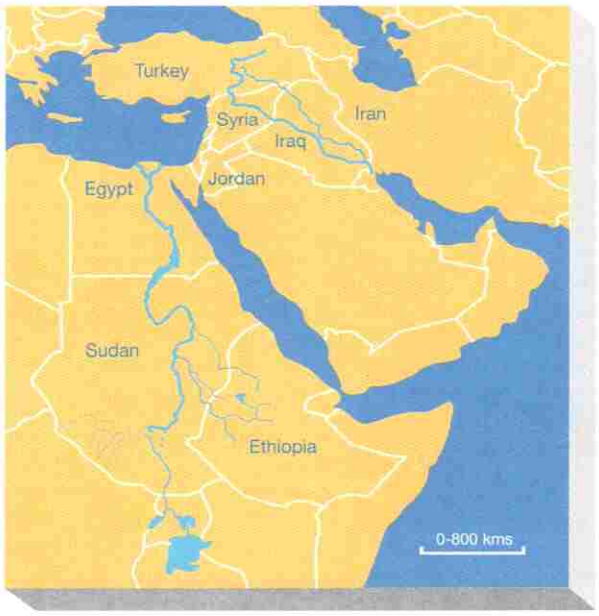
Equally turbulent are the issues regarding the division of the Nile river and its sources. The principal contestants here are Egypt, the Sudan, and Ethiopia (along with several other riparian states). Egypt has long depended utterly on the Nile, to which its territory, however, contributes practically no water. In contrast, Ethiopia (source of the Blue Nile, which generates over 80 per cent of the united Nile's flow) has used very little of its water in the past but hopes to utilize more of it to feed its needy population in the future.

Here the hydropolitical equation is the reverse of that in the Tigris-Euphrates basin: the down stream country is the dominant one, both economically and militarily, so the upstream country cannot undertake unilateral action (as does Turkey) to dam the river and develop its irrigation potential within its own territory. An agreement does exist between Egypt and the Sudan over allocation of Nile waters between them, but this agreement ignores the needs and rights of Ethiopia (as well as of the other riparians). The Egyptians have threatened Ethiopia with military action if it attempts to withhold any substantial amount of water from the Blue Nile, thereby reducing the downstream flow of the united Nile. Having just recently emerged from a prolonged civil war, Ethiopia is now unable to defy Egypt. But the pressing needs of its impoverished people are such that it may not be able to desist indefinitely from using some of the vital waters flowing within its domain.

A joint Egyptian-Sudanese engineering project was begun some years ago to augment the flow of the White Nile by cutting a canal (called the Jonglei Canal) through the Sudd swamps in Southern Sudan. By so doing, these countries had hoped to reduce the amount of evaporation taking place in those swamps, thus increasing the volume of water delivered to them downstream. As is the case in Southeastern Turkey, this intrusive project is resented by some of the indigenous people of Southern Sudan, and their rebellion has effectively halted construction of the canal.

Added to the problems arising from the desire of all nations along the Nile to use more of its waters is the threat posed by global warming. Some scientists conjecture that the enhanced greenhouse effect may increase the frequency and severity of the droughts that periodically afflict the Nile basin, thus reducing the supply of water even while adding to the demand. In the case of Egypt, the projected rise of the sea level (due mainly to the thermal expansion of sea water) poses the further threat of saline water intrusion into the northern sections of the Nile Delta, with a consequent loss of soil productivity there.

Much can be gained by the Nile's riparians from a co-ordinated effort to obtain and share climatic and hydrologic information, and from joint action to improve watershed management as well as the storage, allocation, and efficient use of water for the long-term benefit of all the nations there.



The Jordan Basin

With peace between Israel and Jordan now formalized, political and security issues with the Palestinians progressing, and discussions with the Syrians initiated, water issues along the Jordan basin are to be negotiated explicitly.

Rivalry between Syria and Israel over the sources of the upper Jordan River have caused conflict after conflict over the decades, and may have triggered the 1967 war. One reason Israel is reluctant to withdraw from the Golan Heights is the fact that this territory controls some important tributaries to the Jordan, as well as the northeastern shore of the Sea of Galilee, one of Israel's major reservoirs of fresh water. Therefore, no peace can be achieved or sustained unless it resolves the rivalry over water by safeguarding the vital interests of both sides.

The Hashemite Kingdom of Jordan is already suffering an acute shortage of water. Its major source of water is the Yarmouk River, which, like the upper Jordan, receives much of its water from Syria. Some years ago, the Jordanians and Syrians conceived a plan to build a joint dam (to be called Unity dam) on the Yarmouk for the purpose of supplying water for the desert kingdom and electricity to Syria. For a time, Israel objected, fearing that its own share of that river would be diminished. Now that Israel may be more willing to co-operate, however, the plan is held in abeyance by recent tensions between Syria and Jordan.

In fact, the entire project may have been rendered moot by the construction of a series of dams on the tributaries to the Yarmouk originating in Syrian territory. Those dams have seriously reduced inflows to Jordan. As a stopgap, Israel has agreed to supply the

Hashemite kingdom with additional water from the Sea of Galilee, but the amount is certainly not sufficient to alleviate that country's growing thirst for water to support its agriculture as well as its cities and industries.

Jordan is also engaged in a rivalry with neighbouring Saudi Arabia over the extraction of water from a shared aquifer in the desert. Being a fossil aquifer, its waters are not replenished, and as its water-table falls the costs of further extraction are certain to rise until they become prohibitive.

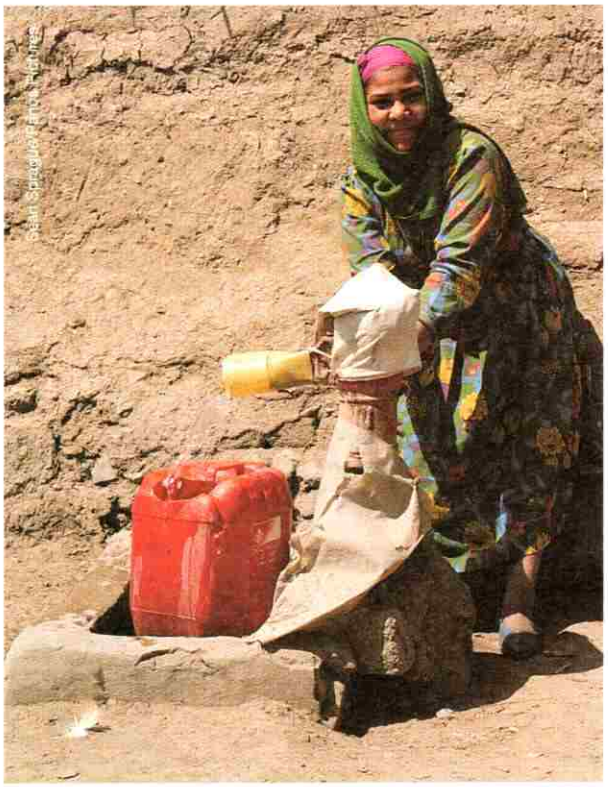
A major issue of contention between Israel and the Palestinians is the use of groundwater from the so-called Mountain Aquifer. That aquifer is recharged naturally by rainfall over the Palestinian territory known as the West Bank, but it flows naturally toward Israel's coastal plain. The Israelis have for many decades been extracting water from the aquifer via a series of wells in their own territory. As the Palestinians gain independence and embark upon a programme of economic development, they will surely require much more water from the same source. Their needs are especially acute in the Gaza Strip, the crowded population of which has already overdrawn its own aquifer. An agreement between the Palestinians and the Israelis over the amount and source of water to be allocated to each side, as well as over the protection of water quality from potential contamination of shared waters by agricultural, industrial, and domestic wastes, must be an essential part of the permanent settlement between the two nations, whose resources and interests are intertwined. Here, even more than elsewhere, the imperative of co-operation can no longer be ignored.

People and water

A basic criterion of freshwater supply is the amount in cubic metres available per person per year (CM/Y). An oft-quoted standard of adequacy is 1,000 CM/Y. In Egypt, the annual supply of water per capita is more than 1,200 CM/Y, but it depends entirely on the Nile, over which there are competing demands. Should stability prevail vis-a-vis the upstream sharers of the Nile, this should suffice for the near-term at least. In Syria and Iraq, current supplies per capita exceed those of Egypt but are threatened by upstream developments. In the entire region, only Lebanon and Turkey enjoy a secure, abundant, and independent supply of water.

In Israel, the amount of water available per capita is presently about 360 CM/Y, well below the standard. With Israel's continuing population growth and industrial development, water use will demand increasing efficiency as well as augmentation.

Much more dire is the situation in the Kingdom of Jordan, where the quantity of water available is already below 250 CM/Y. If its population continues to grow at a high rate while water supplies are further reduced by Syrian appropriation of the Yarmouk headwaters and by exhaustion of the fossil aquifers, Jordan will be forced to change its entire pattern of water use, including the drastic curtailment of irrigated agriculture. International schemes to augment supplies, especially in cooperation with Israel, can help to mitigate Jordan's crisis.



Culture of waste

Unfortunately, a culture of waste prevails as much in the Middle East as elsewhere. A common attitude – a delusion – is that water, being God-given, must be a free good. Water is indeed priced far below its real cost, thus encouraging over-irrigation and the production of water-guzzling crops such as sugarcane, rice, and cotton. Apart from straining water resources, excessive irrigation causes productivity loss due to water-logging and soil salination.

Much can be done and must be done to conserve water. Traditional surface irrigation systems are so inefficient that more than 50 per cent of the water delivered to the field is typically lost by seepage and evaporation. Similarly high losses occur in many of the region's cities owing to the storage of water in shallow open reservoirs, the delivery of water in leaky pipes, and the wasteful use of water in industries, homes, and gardens.

Radical improvements in irrigation efficiency and water use can be achieved by scientific techniques based on the continuous application of water (along with nutrients) directly to the root zone in precise response to crop needs. Such techniques, including drip irrigation, have already doubled crop yields per unit volume of applied water in Israel, and are now being adopted in many other countries. Equally important is the selection of crops capable of providing the highest returns per unit volume of water required for their production.

Much progress has also been achieved in the collection, treatment, and reuse of wastewaters (sewage) – both domestic and industrial. What was formerly regarded as a problem of disposal is now recognized as a resource. With proper care to avoid damage to the environment as well as to public health, waste water can often be used for irrigation, especially of tree crops and of industrial crops.

Augmenting supplies

Efforts have been made in recent decades to augment water supplies by cloud seeding. Under the winter climate conditions in the Eastern Mediterranean, 10 to 15 per cent increases in rainfall can be achieved. Water supplies may also be augmented by inducing and collecting runoff from barren slopes. However, the economic feasibility and environmental impacts of such options must be considered in each case.

A more visionary possibility is the transfer of water from relatively water-rich countries to water-poor countries. Apart from the huge investment of capital and energy, such transfers will require the readiness of all countries involved (including those that provide the water, those that allow it to pass through their territories, and those that are to receive it) to reach dependable, long-term agreements. Among the proposed schemes for cross-boundary inter-basin transfer are pipelines from Turkey to Saudi Arabia and the Gulf States; an aqueduct from the Euphrates in Iraq to Jordan; a line from Iraq to Kuwait; a canal from the Nile across Northern Sinai to Gaza; and the diversion of water from Lebanon's Litani River via Israel to Palestine and Jordan. Even importing fresh water by sea from faraway coastal countries has been considered.

For many, the ultimate long-term answer to the regions water shortage in the Middle East is the desalination of seawater. It was once considered an economically viable possibility on the assumption that nuclear energy could

be cheaply and safely used. The prospects have dimmed, however, as the problems of nuclear power (cost, safety, and radioactive waste) remain unresolved. Only in petroleum-rich countries is desalination practised on a significant scale.

Spurring discussion of desalination is the potential power obtainable from a canal linking either the Mediterranean or the Red Sea with the Dead Sea. Apart from the electric power to be generated by the 400 metre drop, such a canal could also prevent the further shrinkage of the Dead Sea (due to diversion of its tributaries). Two alternative routes have been proposed for such a canal.

Although their economic and environmental feasibility is still open to question, these proposals already provide an example of the great potential benefits of peaceful cooperation.

In conclusion

A complex mosaic of compromises and adjustments, strict conservation efforts and augmentation projects will be required to assure adequate water supplies for the nations of the Middle East. Sectarian conflicts and abuses of nature have wounded the environment in this crucial region, which is now poised on a watershed divide between the alternatives of destructive conflict and constructive co-operation. In a context of peace, water can cease to be regarded as a sacred and exclusive national possession. Instead, it will be recognized as an economic commodity that can be traded among sectors and even nations on the basis of costs and potential benefits, and that will naturally, in a free economy, be applied to the most profitable use.

Water, the most precious and vital of all resources, need not lead to war. Rather than being corrupted into a *casus belli*, it may well quench the fires of enmity and serve as a *casus pacis*, an inducement toward peace. Indeed, peace and water are inseparable and mutually conditional.

In the Hebrew Bible, no less a figure than Moses, whose very name meant "Drawn out of Water", once erred fatefully in his effort to obtain water. As related in chapter 20 of the Book of Numbers, the people of Israel strove with Moses after he had led them into the waterless wilderness: "Why have ye brought us into this wilderness to die here?" Seeing their plight, the Lord then instructed Moses: "Speak ye to the rock before their eyes, that it give forth its water". But instead of speaking to the rock, Moses, probably made impatient by extreme thirst, lifted his staff and smote the rock. Water did come forth, momentarily, but at a terrible price. For so transgressing, Moses, along with his entire generation, was condemned to die in the desert rather than enter the Promised Land. The passage concludes with the words: "These are the Waters of Strife, where Israel strove with the Lord". Now, no less than in the time of Moses, more water can be had by speaking than by striking.

Daniel Hillel, Professor Emeritus at the University of Massachusetts, is one of the fathers of high-efficiency irrigation systems and author of 17 books on water management including the award-winning *Rivers of Eden*, reviewed on page 31.

Left: Woman collecting water from village faucet, Minia, Egypt.
Below: Sugarcane harvest in Egypt: a water guzzling crop.

Numbers and the Nile

The growth of human population is one of several important factors influencing the scale of the use of river water. Perhaps in no other instance, however, is the impact of growing population on a finite natural resource so starkly illustrated as in the case of fresh water, *writes Robert Engelman.*

The farmers of Egypt trust as their ancestors trusted that the Nile River will always bring them the water they need to irrigate their crops.

Yet, for nine of the 10 countries of the Nile River basin (excluding Zaire, most of which lies in the well-watered Zaire River basin), the trends in freshwater availability are bleak. By hydrologists, benchmarks of water availability, the basin countries already are experiencing water stress (defined as less than 1,700 cubic metres of fresh water available per capita per year), with about 1,250 cubic metres per person per year.

Between now and 2025, according to the United Nations' medium projection, the region's population could double from today's 240 million people to more than 480 million.

If it does so, and, crucially, if there is no change in global or regional climate that reduces overall precipitation in the Nile watershed, the amount of renewable fresh water will be halved. With around 625 metres per person per year, the entire basin will be in a condition hydrologists consider water scarcity (less than 1,000 cubic metres per person per year). It is hard to imagine, under such circumstances, that Egypt will be guaranteed the same flow of the Nile River it enjoys today.

Yet the situation is not quite as grim as it might appear. Facing looming water scarcity and the prospect of conflict and even wars over water, policymakers in the Nile basin and elsewhere are beginning to understand just how precious renewable fresh water is, and just how important it is to manage, conserve and plan for.

If governments have enough foresight, the finiteness of river water can encourage not conflict but careful diplomacy, international co-operation and a new era of efficient use of this finite resource.

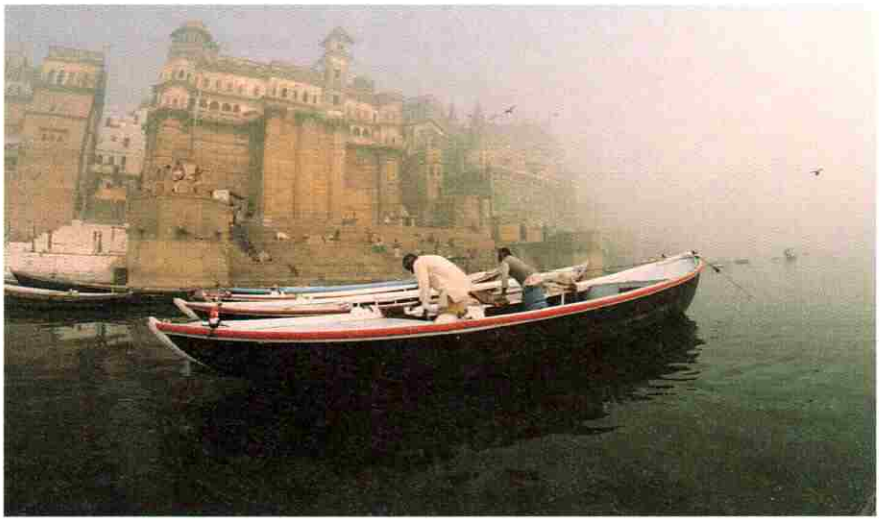
The closing of riversheds also sends governments a further message: only when populations stabilize will the renewable fresh water available to each of us stop shrinking. Brought together, better water management and sound population policies, based on individual choices and rights, could someday guarantee that all rivers reach the sea.

Robert Engelman is Director of the Population and Environment Program at Population Action International in Washington DC.

Jorgen Schytte/Still Pictures

Filthy flows

India's holiest river, the Ganges, is being polluted on a heroic scale. Here **Darryl D'Monte** explains why efforts to clean up are failing. In a complementary article, **Inam Ahmed** and **Aasha Mehreen Amin** report from Bangladesh on the consequences of the Farakka Barrage across the main flow of the river near the border between the two countries, and on the need for more constructive water sharing.



Chris Stowers/Panos Pictures

It is astonishing that a river that all Indians revere as symbolising its ancient culture and spiritually is treated with utter disrespect physically.

The Ganga rises in the Himalayas and flows down eastwards, passing through Bangladesh into the sea. It brings sustenance to the Indo-Gangetic plain, which is one of world's most bountiful food-growing areas. The river basin is inhabited by a little over a third of India's population.

During its 2,525-km-long journey to the ocean, it brings life-giving water to eight states and accounts for nearly half the country's irrigated area. Although devout Hindus still pay obeisance to this holiest of rivers, it has now become almost synonymous with pollution and filth.

There are nearly 700 towns and cities drained by the Ganga river basin, and a hundred of these are located along the river itself. Two notable examples are Kanpur in Uttar Pradesh state, and Patna, the capital of Bihar. These towns release vast quantities of sewage, solid waste and industrial effluents into the river.

This is compounded by the age-old belief that the Ganga, unlike other rivers, has some magical self-cleansing properties, which can absorb any amount of contamination. Dr D. S. Bhargava, an environmental engineer from Rourkee University in Uttar Pradesh, who undertook a three-year journey along the course of the river, found that some 27 major towns dump millions of litres of sewage and industrial waste into the river every day. This includes the effluents from 151 tanneries which empty toxic chrome into the river: only 25 have opted for technology to recover it.

There are also the notorious burning ghats or funeral pyres along the banks, where the last rites of thousands of people are performed. Owing to the steep rise in the prices of firewood in recent years, bodies are often only half-burnt and then dumped in the river, which adds to its contamination.

The entire Indo-Gangetic belt is home to some of the most populous regions in the world. With increasing urbanization, the demands on water from the Ganga are bound to grow. Already, the National Capital Region around Delhi, involving a handful of states, is witnessing a massive change in land use from agriculture to industry. This area bids to outrank the Bombay-Pune region as the country's premier industrial belt. It is difficult to imagine how new city-dwellers there will be able to obtain clean water. In Patna, the disruption of water supply for a few days has led to "water riots".

The primary demand for water, of course, is from irrigation. India has the largest irrigation system in the world, servicing some 70 million hectares of crops. China, by contrast, is aiming at 55 million hectares by the turn of the century.

Critics like B. B. Vohra, believe that despite spending Rs 30,000 crore ($9,000 million) in surface irrigation projects since 1951, when India began her five-year plans, half the potential of the these projects is unused and the productivity of the lands served by them is poor, thanks to poor land and water management. There is tremendous waste of water from canals served by the Ganga, because farmers pay "ridiculously low" irrigation charges and often flood their fields.

Instead of spending more funds on creating more irrigation potential, the alternative would be to use water more carefully. One way is to rely on ground water, instead of surface irrigation. A farmer is always more wary about using such water because he has to pay for the electricity to pump water from wells.

Vohra makes out a case for emulating Israel in metering water for all use, whether it is for irrigation, industries or households. Canal systems should be improved and existing water charges increased so as to reflect the cost of delivery. Half India's total irrigated land depends on ground water today, which is twice as productive as surface irrigation in terms of output, though its use should also be regulated to prevent over-use.

To combat the pollution of the river, the late Prime Minister, Rajiv Gandhi, started the Rs 900 crore ($270 million) Ganga Action Plan exactly a decade ago. At the launch, he said: "The Ganga is a symbol of our spirituality, our tradition, our tolerance and our synthesis. But it is the most polluted river with sewage and pollution from cities and industries thrown into it. From now, we

the Ganga

shall put a stop to all this. We are launching the plan – not for the PWD, but for the people of India."

These brave new words have been swamped by bureaucratic delays. Nearly half the total was spent in the first phase, with little to show for it. The Uttar Pradesh government patted itself on the back for treating a fraction of the 1,400 million litres of sewage and 260 million litres of industrial waste emptied into the river every day.

The second phase, aimed at cleaning up its tributaries – the Yamuna (which flows past Delhi and the Taj Mahal) and Gomti – has not received the publicity the plan enjoyed earlier for obvious reasons.

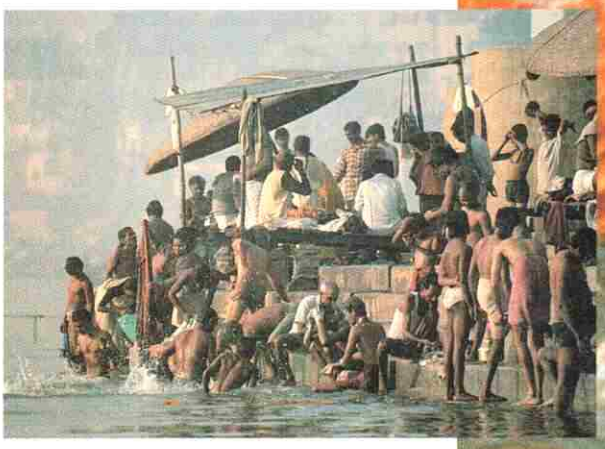
Another threat to the river is from silt deposited in its higher reaches in the Himalayas. The Uttar Pradesh forest department is attempting to plant trees in the catchment areas to prevent soil erosion, but at the current rate of 3,000 hectares of forest a year, it will take 150 years to arrest siltation fully.

According to an independent study commissioned by the Ministry of Environment and Forests, the pollution levels in the Ganga will be worse than 1985 levels if work conducted during the first phase of the Action Plan is not extended beyond 2000 and the river's tributaries are not included.

Attempts to put up latrines to rid the river of human waste have only partly succeeded. In Uttar Pradesh and Bihar, only 60 per cent of the sewage treatment plants have been completed. A few community toilets – even pay toilets

Left: Funeral ghats on the Ganges.

Right: Hindus at the morning bathing ritual.



Hartmut Schwarzbach/Still Pictures

have proved viable – have been installed.

Under the Action plan, electric crematoria are supposed to substitute for burning ghats. However, of four erected in Uttar Pradesh, only one was functioning. In Bihar, the situation was even worse, with one in nine working. Both these states have a poor record in administration and this is reflected in the indifferent progress made in cleaning up the Ganga.

A major reason why the plan has not worked satisfactorily is the negligible participation of people along the river. According to Dr R. K. Sinha, a professor in the Zoology department of Patna Science College, who is associated with the programme in Bihar, "No plan can achieve success without the participation of the local community. If slum dwellers are defecating and polluting the banks and the water, it is because there is no alternative accommodation for them."

The Uttar Pradesh forest department has been trying to rope in school children and villagers to raise nurseries for seedlings for afforestation schemes to stop soil erosion but has admitted that non-governmental organizations have not been involved.

A genuine people's movement, as distinct from a government-sponsored one, which shows what alternatives there are for cleaning up the river is the Ganga Mukti Andolan, or Free the Ganga Campaign. It began 14 years ago to resist the "paanidari" system which gave exclusive rights to big landlords to fish over stretches of the river in Bihar.

In time, the movement has spread to agitating for a ban on the use of cloth nets and the killing of spawn, both of which have led to a big decline in the catch of small fishermen. In 1992, the Bihar government banned "paanidari", but new problems have cropped up. As Parvati Devi, an activist, says: "Our bellies are still empty. We have to fight against pollution of the Ganga."

The movement has called for the closure of factories that pollute the Ganga. The activists have singled out four factories along the 256 km-long stretch from Barauni to the Farakka Barrage near the Bangladesh border which release harmful effluents. These include the Bata shoe factory and the McDowell distillery, both of which empty 250,000 litres of waste a day.

Other pollutants have rendered village wells along the banks unfit for use. Anil Prakash, a leader, says: "The use of cloth nets has now been stopped. But in spite of this, the Ganga has not yet become free. There are many other chains which need to be broken." The movement has also been demanding that use of burning ghats should be made free, so as to rid the river of the mafia which runs these pyres and exploits the boatmen.

The last resort, of course, is legal action. The activist Supreme Court lawyer, M. C. Mehta, has filed a case on behalf of the residents of Delhi to ensure that the Yamuna is kept clean. In response, the Court issued directives from time to time, requiring the authorities to set up sewage treatment plants, since the population of the capital has increased to 9.4 million in 1991. The river is reasonably clean until it enters Delhi where 18 major drains empty waste into it.

Mehta believes that the Ganga Action Plan has failed. "The people are helpless; the institutions have failed. The courts had to step in: there was no other remedy. There is no political will to clean up the environment. Politicians are close to industrialists and their parties are funded by industrialists. They put pressure on the official agencies to adopt a soft attitude towards the polluting industries. The Supreme Court has emerged as the saviour of the environment."

Darryl D'Monte is President of the Indian Federation of Environmental Journalists.

Below: Funeral rites. Bodies are often half-burned and then dumped into the Ganges.

Right: Fishermen at the River Padma show their empty nets.

Sean Sprague/Panos Pictures

Bangladesh:

As the sun's crimson glow spreads across the horizon, a dirty dilapidated truck bulldozes across the sandy, dry land that used to be the River Padma (the main flow in Bangladesh of the Ganges) before India's Farakka Barrage dried out its life. In the twilight, Abdul Barek, 35 prepares for a nightly sally across the border and mysteriously returns with his booty – a couple of smuggled Indian cows.

Barek of Meherpur, Kushtia, in western Bangladesh, once a small farmer, now ekes out a living by smuggling Indian cows, sugar and other items. He was forced to sell off his land because of successive crop failures due to water withdrawal by India at Farakka Barrage.

"What else could I do?" asks a wiry Barek, a few days stubble on his haggard face. "I received water from the Ganges-Kobadak (G-K) irrigation project. But then the pumps could not turn. I could not grow anything on my land for three consecutive seasons. Meanwhile, my debts to the Mahajan (money lenders) began to pile up. So, I sold my land to settle my debt and took to smuggling."

Like Barek, many others have resorted to this illegal profession risking imprisonment, because it at least keeps them alive. About 120,000 farming families living in the G-K project area are suffering because the project has been bogged down by an acute water shortage in the River Padma that flows through India.

Women especially, have been victims of the effect of the Barrage. Saleh Begum, a mother of three small children of Mirpur thana does not know how she will feed them in the days to come. She has not heard from her husband Osman who left for Dhaka three months ago to find work after giving up on his profession as a boatman.

"With the rivers drying up, we have to walk miles to bring water for our daily washing, cooking and drinking," says Shimuli, 35, another village woman, "All the work at home has to be delayed and all this walking and carrying the heavy kolshi (pitcher) has given me a terrible backache."

Many women who used to work in the rice mills are now jobless. Nahar, 35, for example, is now a beggar in Meherpur town. "I was not a beggar," she says, "I used to work in the rice mills. But then business was bad as harvests were affected. There was not enough work for all the 20 women working in the mills, boiling and drying rice. Farm work also vanished as crops failed. I had no alternative but to go begging."

The water crisis originated when the Farakka Barrage, located 19 kilometres from the Indo-Bangladesh border, was commissioned in 1975. Since then the

Waiting for a miracle

water flow in the Padma has been reduced by about 40 per cent.

The two neighbouring countries reached an agreement on Ganges water sharing in 1977 which expired in 1989. Since then there has not been any fresh agreement between the two countries making Farakka a blistering issue between them.

According to available statistics, Bangladesh recorded the lowest 9,200 cusec of water flow in 1993 which at present varies between 12,000 and 13,000 cusec in the dry season. Before commissioning the Barrage, the water flow fluctuated between 65,000 cusec and 70,000 cusec.

Meanwhile, as the water flow dwindled, the G-K project failed to irrigate about 48,000 hectares of dry cropland for high yielding crops last year. It is still uncertain how much of the 350,000 acres of the project will be covered this year, as the lean season starts. Government estimates put the loss due to the failure of the G-K project at over $75 million.

Tampering with the ecosystem which the Barrage has done, has had devastating effects on the environment. One of them has been the gradual death of the River Padma. From Charulia, under Mirpur thana of Kushtia; the once mighty Padma looks more like a broad expanse of dwindling waterway scattered with shoals and sand dunes, conjuring unmistakable signs of desertification.

During the dry season, a period becoming increasingly longer with time, an enormous amount of silt is collected which remains even when the flood gates of the Barrage are opened, says Hasna Moudud, an active environmentalist who has been campaigning against the Barrage for years.

"This rise in siltation has made the flood prone areas even more vulnerable," says Moudad. "The after flood effects have also been strangely negative. Previously when the floods ended, the earth would be replenished and ready for new crops to be sown. Now the moisture evaporates so fast due to siltation that the soil is left completely dry and unfit for agriculture. Natural aquifers have also been destroyed in the process."

Already the north western and south western parts of Bangladesh are going through a process of desertification.

According to Bangladesh Water Development Board statistics, around four million acres of land have been affected by withdrawal of water resulting in irrigation loss, moisture depletion and increased salinity endangering the lives of about 40 million people.

"There's a strong misconception worldwide," says Moudud, "that Bangladesh is a country of too much water. It is true we have as many as 52 rivers coming from India. But we have absolutely no control over them and India has built dams on practically all of them or is planning to do so in the near future."

The continued evasion of the Indian authorities and its failure to recognize the adverse effects of Farakka has caused much bitterness In Bangladesh.

Other effects on the environment are equally frightening. The Gorai, once a major river, is almost dead and many others are in the process of drying up. About 17 per cent of the total Sundari trees of the Sundarbans, the world's largest estuarine swamp, have already fallen prey to the top-dying syndrome due to increased salinity, according to forest department officials. This is threatening the survival of the few Royal Bengal tigers that are left.

While the ecological balance of the rivers are threatened, the misery of an estimated 40 million people continues to increase. Due to the increased salinity a newsprint mill and a power plant in the coastal Khulna region may have to close down, throwing large numbers out of work.

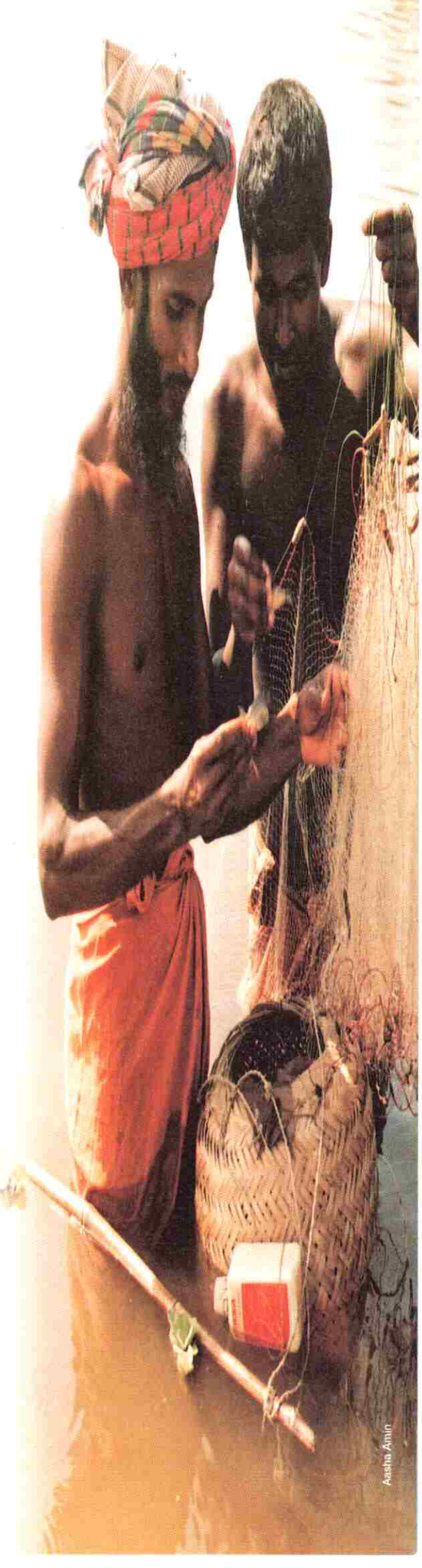
Since the breeding areas of fish have been affected and rivers dried up, many thousands of fishermen and boatmen have lost their only means of livelihood. Many have migrated to the cities and are now rickshaw-pullers or daily wage labourers, earning only a fraction of what they did before.

"Most fishing villages in the Kushtia district of Khulna division in the south west region have virtually disappeared in recent years," says Ashok Swain, Assistant Professor, Uppsala University of Sweden, estimating that around two million people from Kushtia and Rajshahi have left without a trace.

Two decades have passed since the building of a barrage that has been sucking out the life of Bangladesh. In the busy streets of capital Dhaka, Kafiluddin, 38, still dreams of returning to his village in Bheramara while he paddles his rickshaw through the impossible traffic jams and feels repulsed at the thought of going 'home' to the squalid slum he shares with his four-member family.

Three years ago he was a farmer harvesting his own paddy fields. Kafil cannot let go of the hope that someday the water will come back allowing him to return to his village home. Like him there are many others waiting for such a miracle to happen.

Inam Ahmed and Aasha Mehreen Amin are feature writers with the *Daily Star* in Bangladesh. Inam Ahmed is also a contributor to *Rivers of Life* (Panos/BCAS, London, 1994), which critically examines the Bangladesh Flood Action Plan.



"It is as though we do not matter. If and when they choose to tell us thing, they simply inform us as if we were children." These are the words of a villager from Mapeleng in the Lesotho highlands, whose future is threatened by a giant water diversion project. **Korinna Horta** and **Scott Coverdale** report.

Dams & distress for kingdom in the sky

The Mountain Kingdom of Lesotho is the only country on earth whose entire territory lies 1,000 metres above sea levels. Completely surrounded by the Republic of South Africa, it is often referred to as the 'Kingdom of the Sky', because 80 per cent of its land consists of Highlands. These reach from the foothills of the ruggedly beautiful Maluti Mountains to a height of 3,428 metres at Thabana-Ntlenyana, the highest peak in southern Africa.

Just as the Alps, or the Andes are the sources of rivers that sustain their areas of the world, the Maluti Mountains are the source of the Senqu River, known as the Orange River in South Africa, which is critical to the regional hydrology. Most of the water carried by the Senqu (Orange) River during its 2000 kilometre journey to the Atlantic originates in Lesotho.

From Lesotho the river flows in a south-westerly direction and forms the border between South Africa and Namibia before entering the Atlantic Ocean. However, South Africa's centre of power and industry, which has coveted Lesotho's water for many years, lies to the north of Lesotho in the Johannesburg region. The result of this mismatch between the natural flow of a river and the designs of Apartheid-era South African planners has led to the construction of one of the largest interbasin water transfer schemes in the world.

The Lesotho Highlands Water Project is designed to consist of five large dams, including the Katse dam which, at a height of 182 metres, is the highest dam ever built in Africa. In addition an intricate system of tunnels and pumping stations is being built in order to divert the water to its new destination. The two initial project phases, including the Katse and Mohale dams, are expected to export two billion cubic metres of water per year to South Africa.

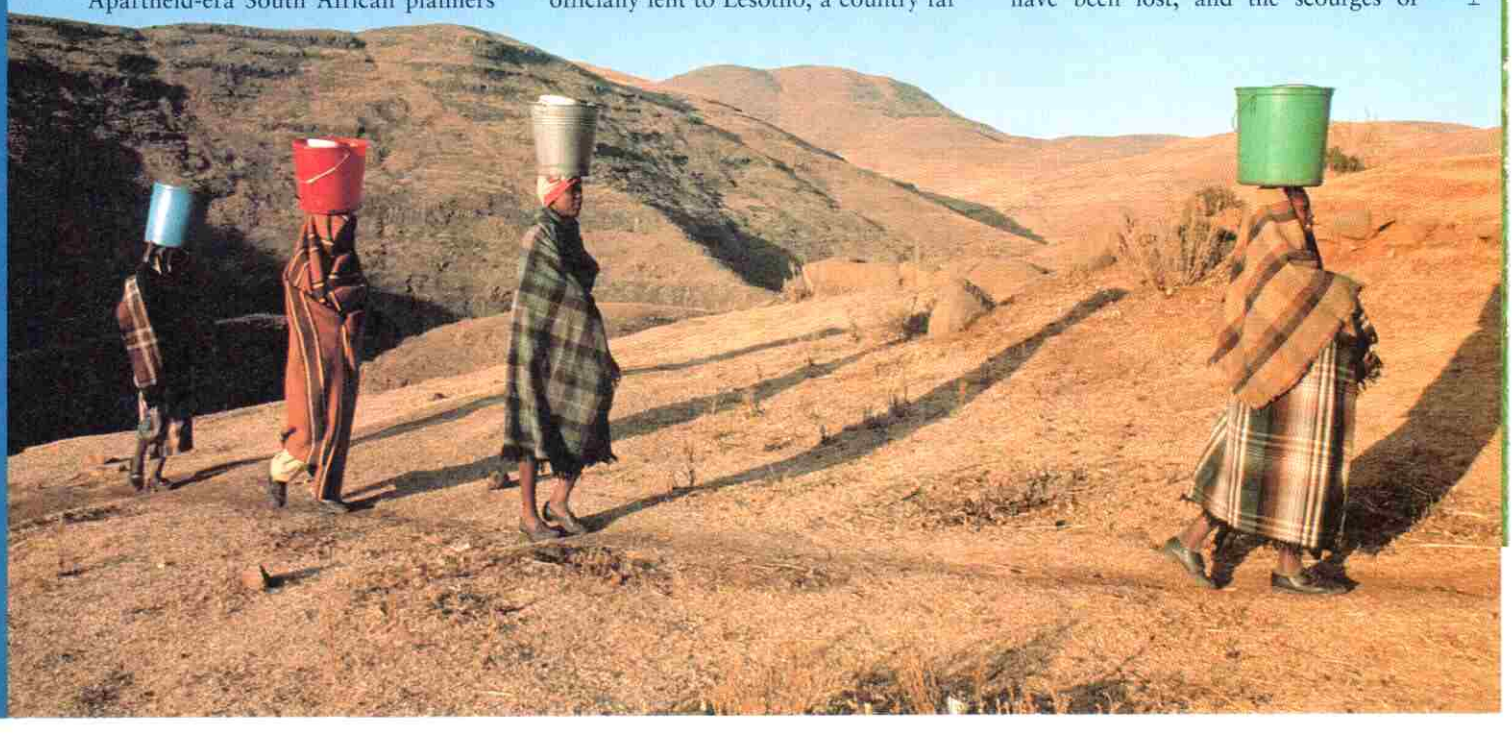
Recently, South African research has shown that original estimates of water available in the catchment were grossly overestimated. Whether the entire project will now go forward as originally planned appears to be open to question. At present, however, the Katse dam is almost completed and work on next dam, Mohale, is progressing rapidly.

Work on the project began in 1986 with the crucial support of the World Bank. Since the apartheid regime of South Africa was under international sanctions at the time, a complicated international financial agreement was put in place whereby the money was officially lent to Lesotho, a country far too poor to qualify for the large amounts of international credits, while Pretoria was in charge of servicing and repaying the debt.

That the project is being presented as a development breakthrough for Lesotho is seen as a tragic irony by many of the 20,000 people who are directly affected by the Katse dam. The fields on which they have depended for generations are being expropriated, villages are being flooded, and grazing lands are being fenced off and destroyed.

Although a huge reservoir is now filling with water, many people's access to clean water has become more difficult as their springs have dried up or been destroyed. Although high-tension power lines have cut through villages and fields, people's access to energy sources has greatly decreased as fuelwood sources in the valley bottoms are being submerged by the reservoir.

Although the project has spent vast sums of money on modern roads, many people have been effectively cut off from friends and relatives in neighbouring communities as it will take a horseback ride of about 72 kilometres to go around the reservoir. And although the project has brought modern health facilities to the Lesotho Highlands, many sources of traditional medicine have been lost, and the scourges of



Hjalte Tin/Still Pictures

AIDS, alcoholism and violent crime have spread explosively through the villages closest to the project sites. Building material for local people has become more scarce with the destruction of riparian trees and grasses.

Government and financial officials, who have promoted the project, have gone to great lengths to present it as a new paradigm for large infrastructure projects. Structurally weak but highly polished plans were proposed for safeguarding affected communities and the natural environment. Expectations were raised that this project would set a new precedent for socially-sensitive displacement.

But today many local people view the project not as development but as tragedy. Promises of jobs and of other benefits, such as water supply and sanitation works for local villages, have not materialized. Policies for compensation and resettlement were arrived at without consulting the affected people, and unsurprisingly, are dissatisfactory to the people on whom they are imposed. Delays and oversights in the implementation of even these poor policies, coupled with a largely unresponsive bureaucracy, has created a groundswell of resentment in many communities.

A full environmental assessment for the construction of the Katse dam and all its attendant infrastructure involving work camps, the blasting of tunnels through the mountains and the building or up-grading of roads has never been carried out. For a project whose goal is to export water, it is especially surprising that erosion and sedimentation problems have received little attention although they may shorten the life span of the reservoirs. In addition, diverting water on such a large scale cannot but has significant downstream impacts on riverine ecosystems, the adjacent agricultural areas and the communities that depend on them. Yet no information on the downstream impacts of the project has been available to the public.

Food security is recognized as a major problem for Lesotho as the country has to rely increasingly on imported staple foods. Only 9 per cent of the country is arable land. The Mohale dam will flood some of the most fertile land in the entire country and further aggravate the lack of fields, local income and food availability in the area. A November 1995 consulting report commissioned by the project authorities warns that "Not only the project area, but the country as a whole will lose an asset of rare quality." The area is home to several endemic species listed as endangered.

According to the World Bank and local project authorities, the Mohale dam will be subject to a complete environmental impact assessment. In view of the high cost of the infrastructure for the dam, such as a major road, which is already being built, it is doubtful that this assessment will give serious consideration to project alternatives.

There is no question that water needs in South Africa's industrial heartland are great. The vast majority of black South Africans, just as their neighbours in Lesotho, have no access to clean water and the new South African government has promised to address this problem. When it became known in Lesotho that President Mandela had endorsed the project, the reaction of local people was summarized by the representative of the Highlands Church Action Group, a local non-governmental organization "Nobody told Mr. Mandela that the Highlands people are suffering as a result of the project. He has only heard the propaganda."

This may well be true as much of South Africa's bureaucracy from the apartheid-days continues to be powerful. Yet all of Lesotho's water would be insufficient to meet South Africa's projected demands. Non-governmental organizations in South Africa have come up with a series of proposals to alleviate the Gauteng Province water problems. For example, much water could be saved through the upgrading of old and faulty pipes which are estimated to leak about 50 per cent of all water passing through them. According to a recent South African Government study, most water in Gauteng province is being used to water the gardens of its urban middle and upper middle income citizens.

Systematic water conservation efforts in combination with a review of the efficiency of water use by South African industries will have to be part of the solution. The new government of South Africa can be challenged to conserve and develop water resources in ways that do not cost other people their land and livelihoods and that do not degrade fragile mountain ecosystems and riverine habitats.

Korinna Horta is an environmental economist with the Environmental Defence Fund, a non-profit organization based in Washington, DC. She travelled to the Lesotho Highlands to research the project's social and environmental effects. Scott Coverdale lived for two and a half years in a community affected by the Lesotho Highlands Water project. He worked with a local NGO, the Highland Church Action Group, to carry out advocacy and research.

Left: Women collecting water at Maseru.

Development tremors

In October 1995 the sluice gates of Katse Dam in the Lesotho Highlands were closed, and the Maliba-mats'o River, a key tributary to the Senqu (Orange) River, became Katse Reservoir. Livestock drowned at the unstable shoreline, riverside trees and prime agricultural land were flooded.

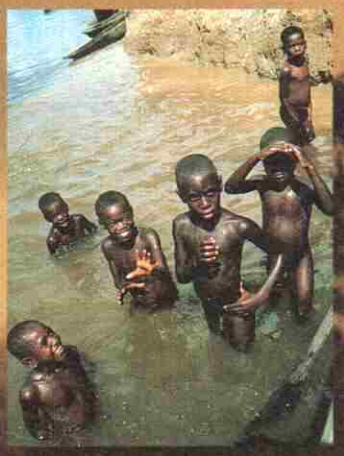
Then in January 1996, a series of earth tremors induced by the geological pressure from the deepening reservoir began to strike shoreline villages. A 1.5 kilometre long crack now runs through the middle of the village of Mapeleng. Many homes were damaged, and several area springs, the only source of water for local villages, dried up. Scientists from Australia and the United States concluded that the earth tremors were directly related to the filling of the dam and warned that these tremors would continue for some time. They were, however, at a loss, with regards to the crack in the earth: they knew of no other cases of surface ruptures resulting from reservoir-induced earthquakes.

The people in the affected Highlands villages are traumatized. In late February 1996, during a Pitso, a traditional meeting of local villagers, they voiced their fears: "We lived in fear while the tremors lasted. We anxiously awaited expert explanation to this phenomenon, only to discover today that the so-called experts are equally puzzled by this crevice. Now that we have been given this report, our fears have been heightened. We cannot understand how we can stay alive here, when the tremors are assured to continue."

"This village was founded in 1939. For almost 60 years we lived comfortably here till October 1995. My family is sitting on a crevice. When I ask, I am told that the foundations to my huts are weak. Yet for 60 years those huts stood strong. I fear that one day when the tremors attack, I shall run outside only to get swallowed by the crevice running between my huts."

"Sometimes it appears as though we are co-operating with the project personnel. We are offered 20 Maloti per person per day to dig [trenches] to bury the water pipes into the earth. Once we were fully engaged, LHDA turned around to say this was for our own good; therefore, there would be no pay. We all abandoned the work, saying we had not asked for these pipes, but compensation was due to us; their monster had swallowed our springs."

"Before this dam came into being, walking across to Ha Konstabole and Spinare was half an hour's business. Now we have to shout out messages regarding illness and death. Is that right in our Sesotho tradition? If nothing is done to ease our life in this respect, they should pump this water out of here. Otherwise this water will become a grave for us and our children."



Backward cou

A major threat hangs over the great Zaire River and, indeed, over the economy and ecology of the entire Zaire Basin, in the heart of Africa. This comes from the potential diversion of a massive part of the river's flow northwards in a grand scheme to alleviate the drought problems of the Sahel.

The Zaire River rises in the south-eastern province of Katanga near Zaire's border with Zambia. Here the river is known as the Lualaba and from its source it describes a great arc, first heading northwards before turning towards the west and finally forging its course southwards. All along its journey it gathers volume as the waters of countless tributaries are absorbed until, at its meeting place with the Atlantic, some 1.4 million cubic feet per second are released into the ocean.

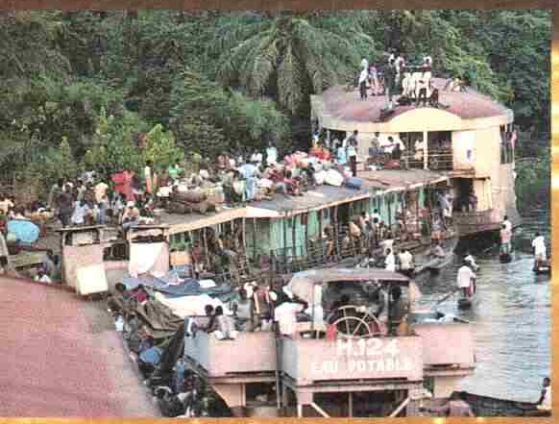
The Zaire watershed covers an area of 4.1 million square kilometres, second only in size to that of the Amazon in South America. Rainforests clothe the slopes rising from the waterways of the Zaire system and the river banks are home to a string of villages, towns and some major cities.

Despite the heavy human activity along its course, the huge Inga Dam and hydro-electricity site and some localized pollution

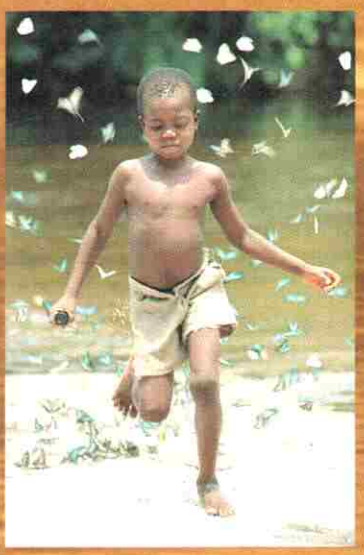
rse for Zaire River?

problems, the Zaire is largely free from degradation through industry. Fresh-water fish provide a major source of protein for many Zairois and over-exploitation of this resource is of growing concern to environmentalists.

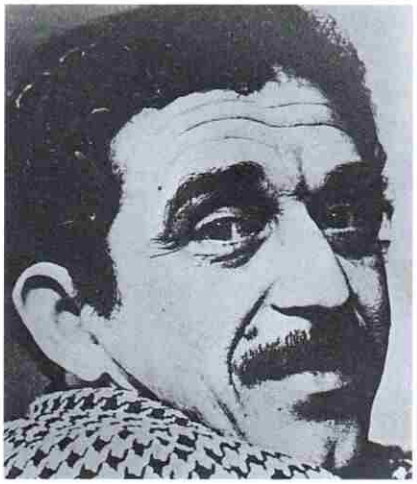
Now, however, the blueprint of a plan to divert the river northwards is said to enjoy the support of Zaire's President Mobutu. The execution of this scheme would be one of the greatest water diversions the world has ever seen – some experts calculate the volume of water at 100 cubic kilometres a year. To put some perspective to this, the huge amount of water would be greater than the entire annual flow of the Nile.



The developmental and environmental problems that would ensue by cutting the Zaire's flow so drastically and the transportation of fish, insects and diseases of the tropical rainforest into a semi-arid desert, are unimaginable. This development would probably also seriously damage the Zaire's vast hydro-electric potential, estimated at about one-eighth of the world's total.



Africa – Environment and Wildlife, March/April 1996 Vol. 4 No. 2. Pictures: K. Ammann



Organization of American States

Nobel-prize winning **Gabriel García Márquez** is perhaps Latin America's best known writer. Born in Colombia in 1928, his novels and short stories have been translated into many languages. In this short essay he remembers the River Magdalena as it was and denounces the rapid environmental destruction suffered in the past few decades by Colombia's main waterway.

The River of our Life

Only one thing could make me want to be a child again: to travel once more by boat on the river Magdalena. Anyone who did not have that experience cannot even imagine what it was like. I had to make the trip twice a year - up to Bogotá and back – during my six years at secondary school and the first two at university.

On each journey I learnt more about life that I ever did at school, and in a better way. When the river was in full flow, the trip from Barranquilla on the Atlantic coast up to Puerto Salgar, the train link to Bogotá, took five days. When there was little rain – which was most often – the trip could take as long as three weeks.

The train from Puerto Salgar wound its way up to Bogotá for a whole day as if clambering from one rocky outcrop to another. In the steepest climbs it would roll backwards to gain impetus, then charge forward again, puffing and blowing like a dragon.

Sometimes the passengers even had to get off and walk up to the next ridge to help lighten the load. The villagers alongside the track were glacial and sad with their eternal women at the train windows selling yellow chickens cooked whole, and creamed potatoes that smelt like hospital food.

The train reached Bogotá at six in the evening, which ever since has seemed to me the very worst moment of life. Bogotá was a dismal, frozen city, with clanking trams that sent up showers of sparks at every bend, and a permanent drizzle of rain mixed with soot.

Men dressed in black hats scurried along, jostling each other as though they had urgent business to attend to. Not a single woman was to be seen on the streets. We had to spend the whole year there, pretending to study, although all we were really doing was waiting for December to come round again so that we could travel on the river Magdalena once more.

In those days the boat had three decks and two long funnels. At night they steamed by like lit-up villages, leaving a trail of music and fantastic dreams in the shut-off riverside hamlets. Whereas Mississippi steam boats had their paddles on the sides, ours had them at the stern, and I have never seen their like anywhere else in the world.

They had immediately accessible names: *Atlantico, Medellin, Captain de Caro, David Arango U.* As in Conrad's stories, their captains were tough but soft-hearted. They ate like brutes but never slept alone in their remote cabins. The crew called themselves sailors as if they put to sea, but when they mixed with real sailors in the bars and brothels of Barranquilla, everyone knew them as 'steamboatmen'.

The journey was slow and full of surprises. In the daytime, we passengers would sit out on the upper deck and watch the world go by. We could see alligators lying in the shadows like tree trunks, their jaws wide open as they waited for some prey to fall in. There were huge number of herons that flew up in alarm out of the ship's wake; flocks of wild duck on the flooded marshes; endless shoals of fish; and on the sandy banks, manatees gave suck to their young with haunting cries that sounded like singing.

Sometimes, we would be awakened from our fiesta by a nauseous stench, and see the huge, swollen corpse of a drowned cow floating down with the current, a solitary vulture perched on its bloated belly. Throughout the trip we were awakened in bewilderment at dawn by the screech of monkeys and the endless clatter of parakeets.

Nowadays, on plane journeys, it is hard to get to know anyone. On those river Magdalena boats, we all ended up like one large family, as we agreed to meet up each year for the journey. The Eljach family boarded at Calamar, the Penas and the Del Toros joined us at La Plata; the Estorino and Vinas families at Magangue, the Villafanes at El Banco.

The longer the trip lasted, the more fun we had. Our lives mixed fleetingly with that of the stop-over ports; more than once their destinies became entwined forever. Vincente Escudero, a medical student, joined the wedding dance at Gamarra without being invited, danced with the prettiest woman there without asking permission, and was shot and killed by her husband. By contrast, during one legendary drinking bout in Barrancabermeja, Pedro Pablo

Guillen married the first girl to take his fancy, and is still living happily with her and their nine children. The irreplaceable José Palencia, a born musician, got himself into a drumming competition in Tenerife, won a cow and sold it on the spot for 50 pesos, a fortune in those days.

Sometimes the boat would run aground on a sandbank for a couple of weeks; nobody minded in the slightest, because the fun continued unabated, and a letter with the captain's sealring imprint was enough to explain the delay in turning up for school.

One night during my last journey for 1948, we were all woken by a heart-rending cry from the riverbank. It was a cow manatee, which had become caught in the branches of a fallen tree. Our captain Climaco Conde Abello, who was one of the finest, ordered his men to train the searchlights on the spot where the commotion was coming from. The men jumped into the water, tied the boat to a capstan, and succeeded in disentangling it. The manatee was a fantastical, strangely moving creature about four metres in length. Its skin was a smooth pale colour, and from the waist up it looked just like a women, with the swollen breasts of a loving mother, and huge sad eyes that shed human tears.

It was this same captain whom I first heard say that the world would come to an end if everybody went on killing the animals of the river. He forbade anyone to shoot at them from on board. "If people want to kill, let them do it in their own homes," he would shout, "not on my boat."

Unfortunately, nobody listened to him.

Thirteen years later, on 19 January 1961, a friend phoned me in Mexico to tell me that the paddle-steamer *David Arango* had caught fire and had been reduced to ashes in the port of Magangue. As I hung up, I had the dreadful feeling that my youth was finally over, and that all that was left of our river of fond memories had gone to blazes along with the steamer.

And so it proved.

Nowadays, the river Magdalena is dead, its water poisoned, its animals hunted to extinction. The conservation work the government has started talking about ever since a group of concerned journalists made the question topical is nothing more than a comic diversion. It will only be possible to rehabilitate the river Magdalena through the strenuous efforts of at least four generations: in other words, a whole century.

People talk too readily of the reafforestation of the river Magdalena. What this in fact entails is the planting of 59,110 million trees along its banks. To spell it out, it would require fifty-nine thousand one hundred and ten million new trees. Even so, the greatest problem is not the number of trees needed, but where they would be planted. Almost all the worthwhile land is privately owned, and a complete reafforestation would mean covering 90 per cent of it. It is worth asking who the kind owners might be who would willingly give up 90 per cent of their land just to plant trees, and in so doing also give up 90 per cent of their current income.

Nor does the pollution affect only the river Magdalena. Not only have all its tributaries become sewage systems for the riverbank towns and villages, but they also carry and accumulate industrial, agricultural, animal and human waste, all of which flows into the gigantic funnel of national filth that is Bocas de Ceniza.

In November 1980, two guerilla fighters fleeing from the army threw themselves into the river Bogotá. They managed to escape, but almost died from being infected by the river water. For many years now, the people dwelling on the river Magdalena, especially in its lowest reaches, neither drink nor use its water, or eat fresh fish from the river. They would be eating – excuse the expression – shit.

The task is staggering, but at least it is measurable. The full plan of what needs to be done is detailed in a study carried out some years ago by a joint Dutch-Colombian team. Its 30 volumes are now gathering dust in the archives of the National Hydrological and Meteorological Institute. The deputy director of the monumental work was Jairo Murillo, a young engineer from Antioquia. He devoted half his life to it, and before finishing sacrificed the rest as well: he drowned in the river of his dreams.

It goes without saying that no presidential candidate in recent years has run the risk of losing his life in the same way.

Translated by Nick Caistor, this essay first appeared in *Environment and Urbanisation*. It appears here by arrangement with *Third World Network Features*.

John Maier/Still Pictures

Any discussion on the emerging global freshwater crisis can take as a starting point two undeniable statistics: planet earth has little freshwater, and it is decreasing on a per capita basis as human populations continue to grow, says **Biksham Gujja** in this final comment.

use more, save more

Freshwater is a major, everyday problem for more than one billion people. More than 50 countries are unable to provide safe and adequate freshwater for domestic use. Yet most of the freshwater discussion tends to be based on the assumption that water is being overused and misused on a per capita basis.

The crisis now becoming apparent in many parts of the world is not due to a decline in the resource as such, in absolute and per capita terms. More than 50 developing countries, particularly in Africa, use less than one per cent of their annual renewable freshwater resources. Per capita freshwater consumption in some of these countries is as low as 50 cubic metres, against a world average of 650 m^3, 1,200 m^3 in industrialized countries, and 2,100 m^3 in the USA. Roughly nine countries in Africa including, Burkina Faso, Congo, Burundi, Guinea Bissau and Zaire, use less than 25 m^3 per capita. National average domestic water consumption (including for animals) is less than 15 litres per person per day. These countries will have to increase freshwater use in future.

Similarly, many developing countries, again particularly in Africa, desperately need to supply electricity to their populations. Many households still do not have electric light. At the same time most of these countries use but a fraction of their potential hydroelectricity.

Africa is estimated to have 1,621,800 megawatts of known exploitable hydroelectric potential. At present the total installed capacity is only 1.2 per cent. In absolute terms the 54 African countries produce 53,000 GWh (million kilowatt hours) of hydroelectricity. By comparison, Switzerland produces 37,000 GWh (almost 95 per cent of potential and 60 per cent of total electricity) and the USA 310,000 GWh of hydroelectricity. By 1975 all western European countries had constructed dams to produce more than 75 per cent of their potential hydroelectricity.

Between 1992 and 1993 the OECD countries increased their hydroelectricity production by 70,000 GWh, more than the total produced by the entire African continent.

Moreover, Africa's total electricity production (329,000 GWh of which South Africa alone produces 169,000 GWh) is less than 10 per cent of that generated by the United States.

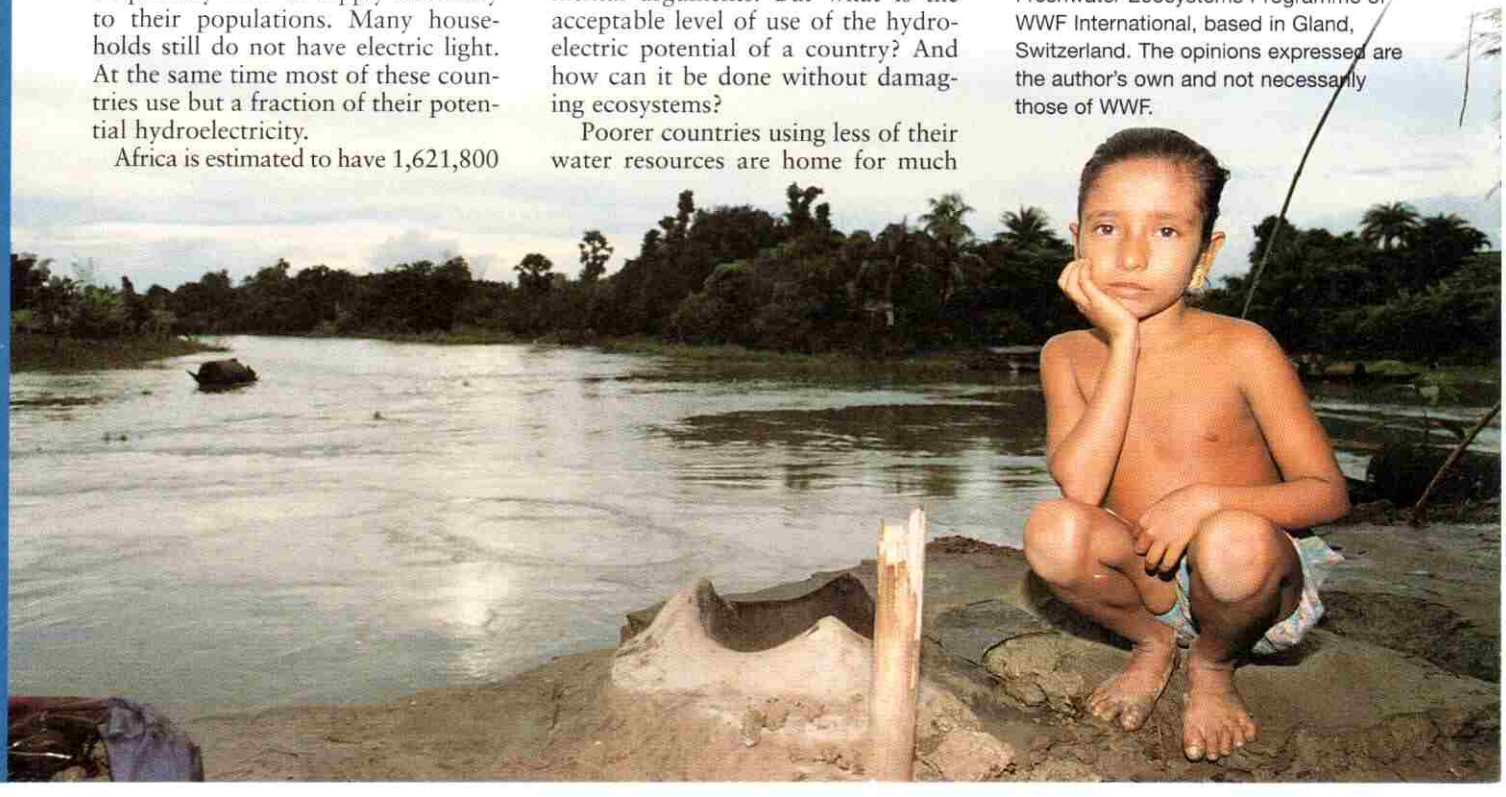
Any attempt to increase hydroelectricity production in Africa is bound to raise the issue of conservation and wildlife. Recent proposals by Namibia to build a dam on the Cunene river at Epupa falls, and by Nigeria to build Kafin Zaki dam, have raised valid social and environmental arguments. But what is the acceptable level of use of the hydroelectric potential of a country? And how can it be done without damaging ecosystems?

Poorer countries using less of their water resources are home for much of the planet's remaining tropical forest and wildlife. The future of biodiversity in Africa clearly depends on how the continent uses its freshwater resources in the coming decades. Freshwater use is related to food security, social order, and political stability. The challenge facing the world is to derive ways and means to increase freshwater use and hydroelectric production while conserving biodiversity. Any further delay in this direction will cause serious and irreparable damage to natural, biodiverse systems.

This is not a new issue. It has been said many times in the past. But the conservation agenda today is dominated by the North and elites in the South who hold different views, especially towards nature and wildlife.

The world as a whole may have to save water on a per capita basis and reduce the number of dams. While some countries will have to increase their use of freshwater and produce more hydroelectricity, others will seriously have to consider reducing water use and remove some dams on rivers to restore valuable wetlands and re-establish free-flowing rivers.

Biksham Gujja is Manager of the Freshwater Ecosystems Programme of WWF International, based in Gland, Switzerland. The opinions expressed are the author's own and not necessarily those of WWF.



Gadfly by Norman Myers

South Africa's growing pains

South Africa has resolved problems aplenty in the last few years. Could it be that one of the biggest future problems remains virtually untackled - and that it could eventually unravel many of the fine efforts deployed to build the new South Africa? Its name – you've guessed it – is population.

South Africa has 45 million people. Their numbers are increasing at an annual rate of 2.3 per cent, or over one million people per year. Even allowing for stepped-up family planning programmes, the total is projected to reach 58 million by 2010, 70 million by 2025, and 103 million by the time of zero growth. How are all those people going to achieve the enhanced livelihood that they yearn for? Already there are signs that the country's population is over-loading its environmental supports.

Consider water, for significant instance. Two-thirds of the country receives less than 20 inches (500 millimetres) of rainfall per year, and evapotranspiration is generally greater than precipitation. So there is scant scope for farming to absorb the fast-growing multitudes. Fortunately a full 63 per cent of the populace are already urbanized, well over twice the average for Sub-Saharan Africa. Abundant minerals should enable the country to build up its industrial and manufacturing base, generating greater employment in the cities. But industry needs water, lots of it. According to Tami Sokutu of the African National Congress' Environment Division, the country is already using two-thirds of its surface water, and both industrial and household consumption are expected to almost double as early as 2010.

In fact, a water expert, Dr Bryan Davies of the University of Cape Town, believes the country will reach a state of 'permanent man-made drought' as early as the year 2000, after which it may soon become as thirsty as several desert countries of North Africa today. In 1995 the industrial heartland endured several months of water restrictions. One third of all citizens lack access to drinkable water, yet the government wants every South African to be supplied within just five years.

Of course, all depends on how many people (increasing in numbers fast) want water – and how they use it. According to Dr Guy Preston of the University of Cape Town, an affluent citizen consumes about 1,750 litres of water per day for household purposes. A middle-income person uses 250-150 litres, and a shantytown dweller 15 litres (equivalent to a single flush of the rich citizen's toilet). In Cape Town and the rest of the Western Cape region, there are 400,000 households, plus schools, factories and the like. Dr Preston calculates that if they were to switch to low-flow showerheads and dual-flush toilets, they would save more water than is to be delivered by a new dam – and do it at a quarter of the capital investment and with none of the operational cost. Meanwhile, the dam is being built primarily to satisfy the "needs" of affluent Cape Towners.

Dr Preston, now a principal adviser to the government, demonstrates that there are many other conservation measures for the rich to adopt, with benefit for their pockets as well as for the poor. Through simple conservation actions, the rich could chop both their water and electricity bills in half at least, enabling an average household to save the equivalent of US$700 per year. Dr Preston calculates this on the basis of research he has conducted on visitors to South Africa's famous game parks. If all park visitors were to average these savings back home, the country could save four and a half times more than it will spend on wildlife conservation in 1995, 70 times more than on AIDS education, and 75 times more than on family planning and other population programmes. It would be a win-win situation all round.

This is not, of course, to overlook the imperative of tackling population growth itself. Runaway growth in the past means that South Africa is now stuck with the need to, for instance, cater for more than 240,000 extra pupils per year, which means building three new 1500-pupil schools every week. In fact, the government aims that all children shall enjoy primary education as soon as possible and by 2015 at the latest. The money required could have been used to create more jobs, housing and the like for adults; and the level of funding that has to be allocated to all forms of infrastructure such as schools, hospitals and roads rather than to new factories with their jobs, is one reason why the economy has faltered in recent years. The average standard of living has dropped by 20 per cent, reverting to the 1971 level. In 1990, more than 17 million people, or two out of every five, lived below "absolute minimum" standards.

But should one speak of shortages of facilities and resources – or 'longages' of people? Fortunately South Africa has done better than most African countries on the population front. Its annual growth rate is the lowest of any large country in Sub-Saharan Africa, and the same applies to its fertility rate of 4.1 children, while life expectancy at 66 years is the highest. The country has already passed partway through its demographic transition insofar as the proportion of people under 15 years of age is 37 per cent, whereas most countries of Sub-Saharan Africa are closer to a whopping 50 per cent.

South Africa has a long way to go. Roughly half of all pregnancies are unplanned (resulting in 600,000 babies per year). If the latter were reduced by one third, it would cut population growth by almost one fifth. The cost? No more than one twelfth of four corvette battleships sought by the National Defence Force from Europe. Yet as Dr Preston points out, the biggest threat to South Africa's security is not foreign attack from overseas. It is the failure to invest in the future of South Africans by ensuring they shall all have food, water, education, health, housing and jobs.

There is no doubt that President Mandela and his government have worked wonders in handling the transition to a democratic South Africa. They have gone far in establishing a promising economic future. But they have not gone nearly far enough to secure the environmental resources that ultimately underpin much of the economy. Nor have they given enough prominence to the question of how many people will eventually be claiming a piece of that economy. At present rate, there will be twice as many within the lifetimes of most South Africans alive today.

Norman Myers, environmentalist & author, teaches every January at the University of Cape Town.

Associates news

IPPF

PAKISTAN PROGRAMME

Poor access to family planning services and other health-care, along with the abysmally low status of women, is undermining Pakistan's prospects for economic and social development, according to a new study by Population Action International (PAI). Nevertheless, recent developments in the country's family planning programme are cause for cautious optimism.

Family planning services reach just a quarter of Pakistan's people, according to the PAI study, *Pakistan's Population Program: The Challenge Ahead*. Only a third of women have access to a trained health worker in pregnancy and childbirth, and 600 women die for every 100,000 live births. Cultural attitudes that reinforce women's low social status are further obstacles to their use of family planning and other health services.

Pakistan's rate of population growth – at 2.9 per cent among the highest in Asia – effectively cut in half the country's 6 per cent of economic growth in the 1980s. With 140 million people, Pakistan is already the world's seventh most populous country. The country is expected to rank fifth in 2020, when its population is projected to reach 262 million, and third in the world in 2050.

In 1993, the government launched an ambitious 'social action programme' to expand basic services in health, education, family planning and rural water supply. On the family planning front, efforts are focused on introducing contraceptive services in all government-run health facilities and on expanding networks of health and family planning outreach workers in rural communities. The plan calls for more than a doubling of spending on family planning, from $40 million in 1994 to $100 million by 1998.

The United Kingdom, Germany and the UN Population Fund are now the principal donors of grant aid to Pakistan's family planning programme, according to PAI. The United States halted economic aid to Pakistan in 1993 following a dispute over nuclear policy.

This is the third in PAI's country study series. Earlier studies examined the family planning programmes of China and India.

For further information, contact PAI, 1120 19th Street NW, Suite 550, Washington DC 20036, USA.
Tel: (+1 202) 659 1833, Fax: (+1 202) 728 0745, Email: sae@popact.org

WATER AND POPULATION

Apart from the occasional conference, environmentalists and population specialists rarely meet one another, let alone carry out truly collaborative research. Now the World Conservation Union (IUCN) is planning to remedy that.

In an effort to build inter-disciplinary bridges and to develop new policy recommendations, IUCN has invited its member organizations to create two-person teams composed of one IUCN affiliated water specialist and an outside population expert. The teams will develop country-specific case studies examining the impact of population dynamics on water resources.

The topics are wide ranging, including among others, population change and water use in the Indus River basin, oasis conservation in Jordan, water quality and sanitation in the Peten rain forest, community-based water management systems in India, and the competing demands for water between agriculture and industry in eastern Zimbabwe.

From these case studies, and from discussions at an October workshop to be held in conjunction with the World Conservation Congress, the initiative will distil a set of lessons learned for improved water management policies and practices.

This project is being carried out in collaboration with the Population Reference Bureau (PRB) with funding from the US Agency for International Development. A report of the workshop proceedings will be published by the Population & Sustainable Development Project of the American Association for the Advancement of Science.

For further information, contact
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Email: amd@hq.iucn.ch

Liba Taylor/Panos Pictures

ARAB INITIATIVE

The Arab World Region of the International Planned Parenthood Federation (IPPF) is setting up an advocacy group of prominent leaders as a regional lobby to increase material and moral support for family planning and reproductive health programmes, and plans to establish an Arab Parliamentarians' Group to advocate for legal change on family planning issues.

These initiatives were recommended in January by over 140 participants from 14 Arab countries at an IPPF Regional Conference in Cairo on implementing the Programme of Action of the 1994 International Conference on Population and Development (ICPD).

Although ICPD itself was held in Cairo, many Arab countries have dragged their feet on implementing its Programme of Action, which placed emphasis on women's reproductive health and empowerment. The participants at the IPPF meeting included representatives from Lebanon and Sudan, which had boycotted ICPD.

ON THE PULSE

Medical science often fails to recognize the link between women's hormonal balance and the risk of chronic diseases such as breast endometrial and ovarian cancer, cardiovascular diseases and osteoporosis, says a new Population Council report.

In *What we do and do not know about the menstrual cycle; or, questions scientists could be asking*, epidemiologist Dr Sioban Harlow challenges researchers to undertake a comprehensive study of the menstrual cycle that goes beyond questions of fertility. "The menstrual cycle appears to modulate several aspects of women's physiology, including heart rate, pulse, transit time and blood pressure, energy metabolism, and various aspects of immune function," says Dr Harlow. "All too often, the menstrual cycle is viewed solely as a mechanism to achieve pregnancy. The continued failure to perceive and investigate linkages between menstruation and women's health carries great cost."

The report calls for more research on certain breast cancer treatments, citing evidence that the timing of surgery during a woman's menstrual cycle may affect her chance of survival. Dr Harlow also recommends additional research into menstrual dysfunction that cause substantial disruption to women's daily lives.

For more information contact the Population Council, One Dag Hammarskjold Plaza, New York, NY 10017, USA. Tel: (+1 212) 339 0500, Fax: (+1 212) 755 6052.

RELIGION AND POPULATION

The National Audubon Society's Human Population and Resource Use Department is currently sponsoring a series of population, environment and religion seminars across the United States. The series is designed for increasing dialogue among religious groups on the complex issues surrounding human population growth and the environment.

Based on the booklet, *Faith, Justice and a Healthy World*, by Dr Patricia Waak, Director of Audubon's Population Program, the seminars encourage consensus-building at local, national and international levels.

Three seminars were held in Dallas, Texas and included members of the local Methodist Church, the Unitarian Church, the local Audubon Societies, the League of Women Voters, National Wildlife Federation, USAID, Planned Parenthood amongst others. A panel of speakers addressed a variety of subjects including the impact of population on the environment, reducing consumption, and ways in which religious communities can promote conservation.

Heine Pedersen/Still Pictures

Seminars are also planned for this fall in California, Florida and New York.

For further information and volunteer opportunities contact, Lindsay Aun, National Audubon Society, 4150 Darley Ave, Suite 4, Boulder, CO, USA. Tel: (+1 303) 499 5155, Fax: (+1 303) 499 0286. Email: LAun@audubon.org. Copies of Faith, *Justice and a Healthy World* are available for US$5.

POPULATION AWARD

Pathfinder International has been awarded the prestigious United Nations Population Award. The other recipient is Senator Leticia Ramos-Shahani, a leading advocate for population policies and programmes in the Philippines.

Pathfinder International was chosen for its 39 years of sustained effort in developing and improving family planning programmes around the world and creating global awareness of population issues."

Pathfinder's programmes have helped millions of women and their families, many of whom live in conditions of extreme hardship," commented Dan Pellegrom, Pathfinder President. "This award is particularly heartening in the face of the recent Congressional cuts to the United States Agency of International Development, which threaten to dismantle decades of progress."

Contact, Penelope Riseborough, Technical Communications Unit, Pathfinder International, Nine Galen Street, Suite 217, Watertown, MA 02172-4501, USA. Tel: (+1 617) 924 7200, Fax: (+1 617) 924 7200.

REACHING YOUNG PEOPLE

Each year 15 million women under age 20 give birth, accounting for almost 20 per cent of all births worldwide. Many of these births and pregnancies are unintended, mostly mistimed, according to a new report *Meeting the Needs of Young Adults* by Johns Hopkins School of Public Health.

Studies in various countries show that women delay about one year on average between starting sexual activity and first using contraception. Thus premarital sex often results in unintended pregnancy. In Kenya, for example, a Demographic and Health Survey found that 74 per cent of pregnancies among unmarried women were mistimed or unwanted; in Peru 69 per cent. In the United States, 80 per cent of the one million teenagers who become pregnant each year do so unintentionally.

Even among young married couples many births are unplanned. In Peru, for example, 51 per cent of current pregnancies among young married women are unintended. In Chile the figure is 35 and in Pakistan 34 per cent.

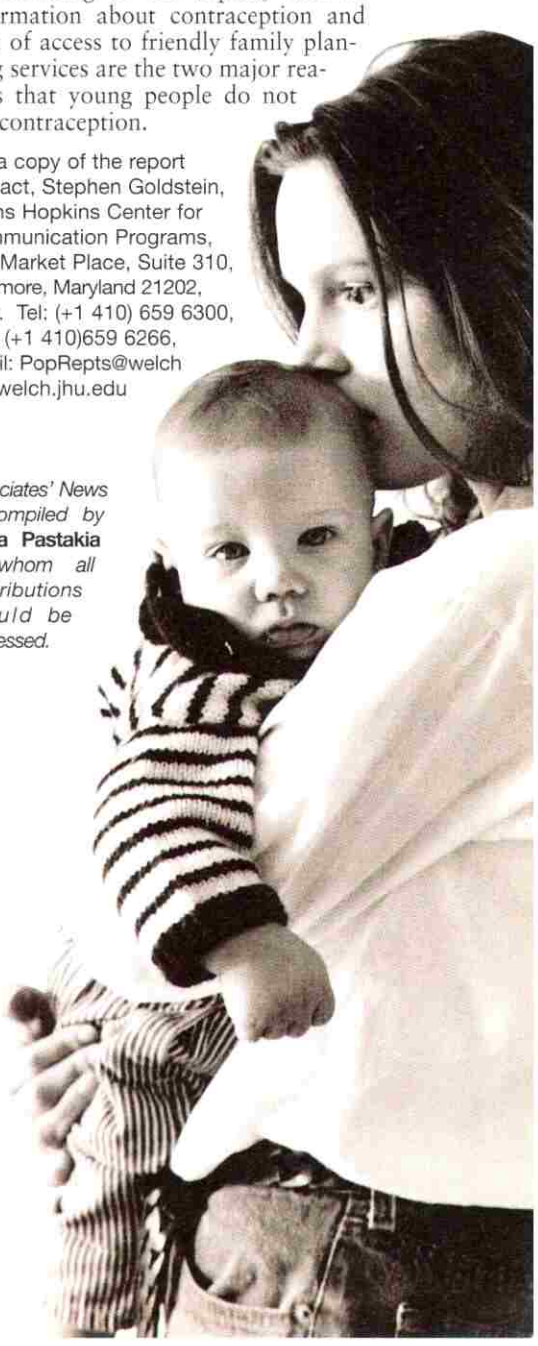
"Young adults, married and unmarried, have largely been left out of the recent reproductive revolution among older, married women - more and more of whom are planning how many children to have and when," says Dr Phyllis Tilson Piotrow.

In addition, pregnancy puts young women's health at risk, through childbearing, unsafe abortion, or disease. For example, in Africa women under age 20 account for as much as two-thirds of all cases of abortion complications treated at selected hospitals. At least half of the 6 million people worldwide infected with AIDS-causing HIV are under age 25.

According to the report, lack of information about contraception and lack of access to friendly family planning services are the two major reasons that young people do not use contraception.

For a copy of the report contact, Stephen Goldstein, Johns Hopkins Center for Communication Programs, 111 Market Place, Suite 310, Baltimore, Maryland 21202, USA. Tel: (+1 410) 659 6300, Fax: (+1 410)659 6266, Email: PopRepts@welchlink.welch.jhu.edu

Associates' News is compiled by **Maya Pastakia** *to whom all contributions should be addressed.*



Paul Smith/Panos Pictures

Films

Gil Moti/Still Pictures

END OF EDEN

Since the end of the Gulf War in 1991, Iraq has been ruthlessly destroying one of the oldest civilisations on earth and their ecologically unique homeland.

They are the Marsh Arabs: their world is the great Mesopotamian marshlands, situated between the Tigris and Euphrates rivers, where Iran, Iraq and the Persian Gulf meet; a region better known for thousands of years as the biblical Garden of Eden.

Until recently this was the largest wetland ecosystem in the Middle East. But since the end of the Gulf war the Iraqi regime has been mounting a systematic operation to drain the marshes in a bid to flush out the people for whom it was home.

People have been living in these once vast marshlands for 10,000 years. Over this time the Marsh Arabs have developed a sophisticated if isolated culture, building their communities afloat on great rafts of reeds. Home to a rich diversity of wildlife, the marshes beautiful and impenetrable maze of waterways provided for all their needs. Now, most of the fish are dead and migratory birds no longer visit.

The Marsh Arabs, had already suffered 20 years of persecution at the hands of Saddam Hussein when the Gulf War broke out in 1991. Believing the West would back them and crush their oppressors, they rose up with the Shi'a Muslims against the Iraqi regime. But the war ended and the Western troops went home leaving the Marsh Arabs to pay the price. Saddam Hussein's elite Republican Guard moved in and began to exact a brutal revenge. Four years, 100,000 deaths, and half a million refugees later the reprisals continue.

Produced and directed by anthropologists Andre Singer and Michael Yorke, *End of Eden* features haunting archive footage of a people and a region unchanged in 10,000 millennia, and also visits present day refugee camps for a perspective, on a tragedy that international governments and media have actively ignored.

A NARMADA DIARY

"Man must harness nature in order to create a better life for himself. The Narmada Sardar dam is the new temple of modern India," booms a 1971 Indian government propaganda film, *A Village Smiles*. But the Adivasi, original inhabitants of the area under threat of submergence by this massive dam project, are not smiling.

In 1985 the 'Save Narmada Movement' (NBA) began a determined campaign of peaceful resistance to the dam, refusing to move from their land even if it meant drowning. Film-makers Simantini Dhuru and Anand Patwardhan spent five years making this gripping record of the Adivasi's struggle.

Leaving the land is a "necessary sacrifice" for development, say officials but, a protester asks, "can they explain why some gain so much, and others lose?" Denouncing the inadequacy of resettlement and compensation arrangements, the Adivasi say the dam will be of no benefit to them and that they are effectively being told to donate their homes to the government.

Under pressure from the NBA, and mounting evidence of serious flaws in the plans, the World Bank withdrew its funding for the project in 1993. But the Indian government refuses to discuss the issue with the NBA and presses on, harassing the local population to drive them out. "Fire on us now! Why wait to drown us later?" demands one woman. She has not long to wait: by the film's end, the water level has reached 80.3 metres and the next monsoons will flood most of the villages previously depicted.

Nick Rance, Nick Bradshaw

End of Eden and *A Narmada Diary* are available from the Distribution Office, TVE, Prince Albert Road, London NW1 4RZ Tel: +44 (0) 171 586 5526 Fax: +44 (0) 171 586 5526 Email: tve-dist@tve.org.uk

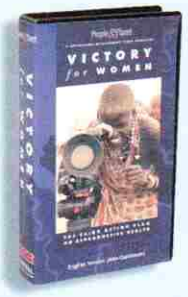
Our first three half-hour videos, focusing on the empowerment of women are ***now available in English, French and Spanish versions.***

Victory for Women
Reports on the Cairo Conference, with footage from Egypt and Colombia on reproductive health.

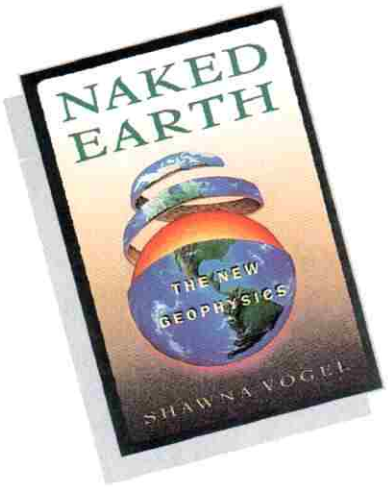
Learning for Life
Looks at how education for women and girls can liberate their lives, with film from Senegal and Bangladesh.

Calling the Shots
Tells how women are finding new ways of communicating, filmed in India and Jamaica.

Contact TVE at the address above.



Books



HIDDEN MYSTERIES

The Naked Earth: The new geophysics

Shawna Vogel

Dutton (Penguin) New York, 1995 US$21.95

Impressive scientific and technological advances are unravelling the longstanding mysteries of what lies beneath the surface of planet earth.

Science journalist Shawna Vogel shows how advances in geophysics are providing startling new knowledge and concepts concerning the earth's core, tectonic plates, magnetic fields and other subjects. Nor is this research arcane since it is helping us to better understand and to prepare for natural disasters that threaten millions of human lives.

One of the most striking examples of basic research tied to saving lives was the early detection of the Mount Pinatubo volcano in the Philippines, in 1991, and the safe evacuation of 200,000 persons.

We live on a planet which is rapidly changing in geologic time – changes which may impact on the global climate. Accessible to laymen, this excellent volume explains how the advances in our understanding of what lies beneath the surface are fundamental to our ability to cope on the surface.

Aaron Segal

Dr Segal is Professor of Political Science, University of Texas, El Paso.

NUMBER CRUNCH

How Many People can the Earth Support?

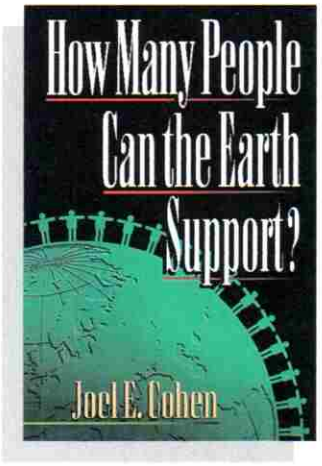
Joel E. Cohen

W.W. Norton, New York and London 1995 US$30

Given the impossibility of the task, maybe it is fitting that a book answering this title question should be written by a New York City comedian. But besides doing stand-up humour, the author holds two doctorates and heads Rockefeller University's Laboratory on Populations, which makes him worth reading as much for his scientific rigour as for his wry commentaries on the other, more polemical population writers' absolute certainties on so complex a query.

Cohen questions the question itself after examining some of the 66 scientific answers to it that have been published over the years - the first from 1679 (13.4 billion), and the last four from 1994 (ranging from 3 to 44 billion). In between are some truly eye-popping numbers - Paul Ehrlich's well-known 1971 estimate of .5 billion, when the world population was already 3.7 billion, and a tongue-in-cheek physicist's estimate of a billion billion, based on the global warming potential of heat radiation from human skin.

The book finds considerable flex in the very definitions of human carrying capacity. An appendix lists 26 different explanations that accompany some of the calculations already mentioned from Garrett Hardin's bluntly stated "This question evokes a reply of no



human use" to Donella Meadow's (of Club Rome fame) slippery caveat, "carrying capacity is a dynamic concept. It is always changing with...the pressure exerted by the species being carried."

This is not to say that the entire exercise is fruitless. The 1992 Rio Conference's Agenda 21 document calls for estimating national human carrying capacities in the context of basic human needs, sustainable development, critical natural resources, and environmental protection. But in an age of world trade, consumerism, and cultural exchange, Cohen persuasively shows how global carrying capacity is no longer simply a sum of its national or regional parts.

Although over the last decade there has been more, rather than less, variation in the hard estimates, there does seem to be a rough consensus that the earth is now approaching an upper limit. One half of the estimates are under 7.7 billion, which if correct means we will not be able to sustain our currently projected world population for long.

And thus Cohen ends with a three-choice menu for balancing population and resources in the future. We can bake a bigger pie (increase production), put fewer forks on the table (reduce our numbers), or learn better manners (change the way rich and poor countries interact). While he obviously believes in moving on all fronts together, his advocacy for the neglected third option is what makes this book so appealing.

Louis Werner

Louis Werner is a writer and film-maker with a special interest in population.

STRUGGLE FOR WATER

Rivers of Eden: The Struggle for Water and the Quest for Peace in the Middle East.

Daniel Hillel

Oxford University Press, Oxford, New York, 1994. US$30

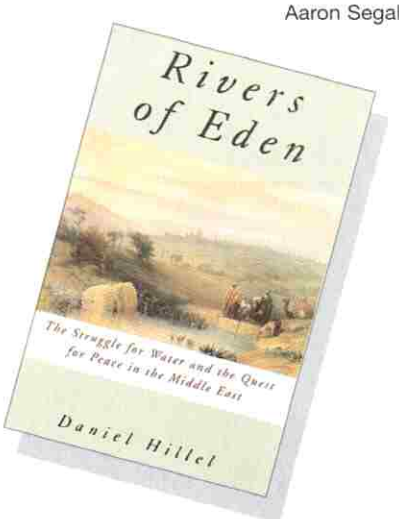
Conflicts over water are raging between Turkey and Iraq and Syria over the Tigris and Euphrates rivers and between Israel, Jordan and Palestine and Syria over the Jordan River. This informative, profound and objective book takes readers back to ancient Middle Eastern civilization to trace the present, the history and current status of river use in the region.

It is a masterful combination of comprehensible explanation of technical river management with the convoluted political and economic struggles. The potential for multinational co-operative river development is clearly presented as well as waste of previous water. Options such as waste water treatment, Dead Sea canals and pipelines, and desalination and conservation are lucidly examined.

The conclusions are optimistic based on solid, in depth analysis. Thus, for Israel, Jordan, and Palestine "the erstwhile rivals must achieve a compromise that will ensure the equitable sharing of all available groundwaters and surface waters, while strictly protecting their quality and sustainable yields, as well as their efficient utilization."

An invaluable book for understanding the history, current status, and future prospects for water use in the region.

Aaron Segal



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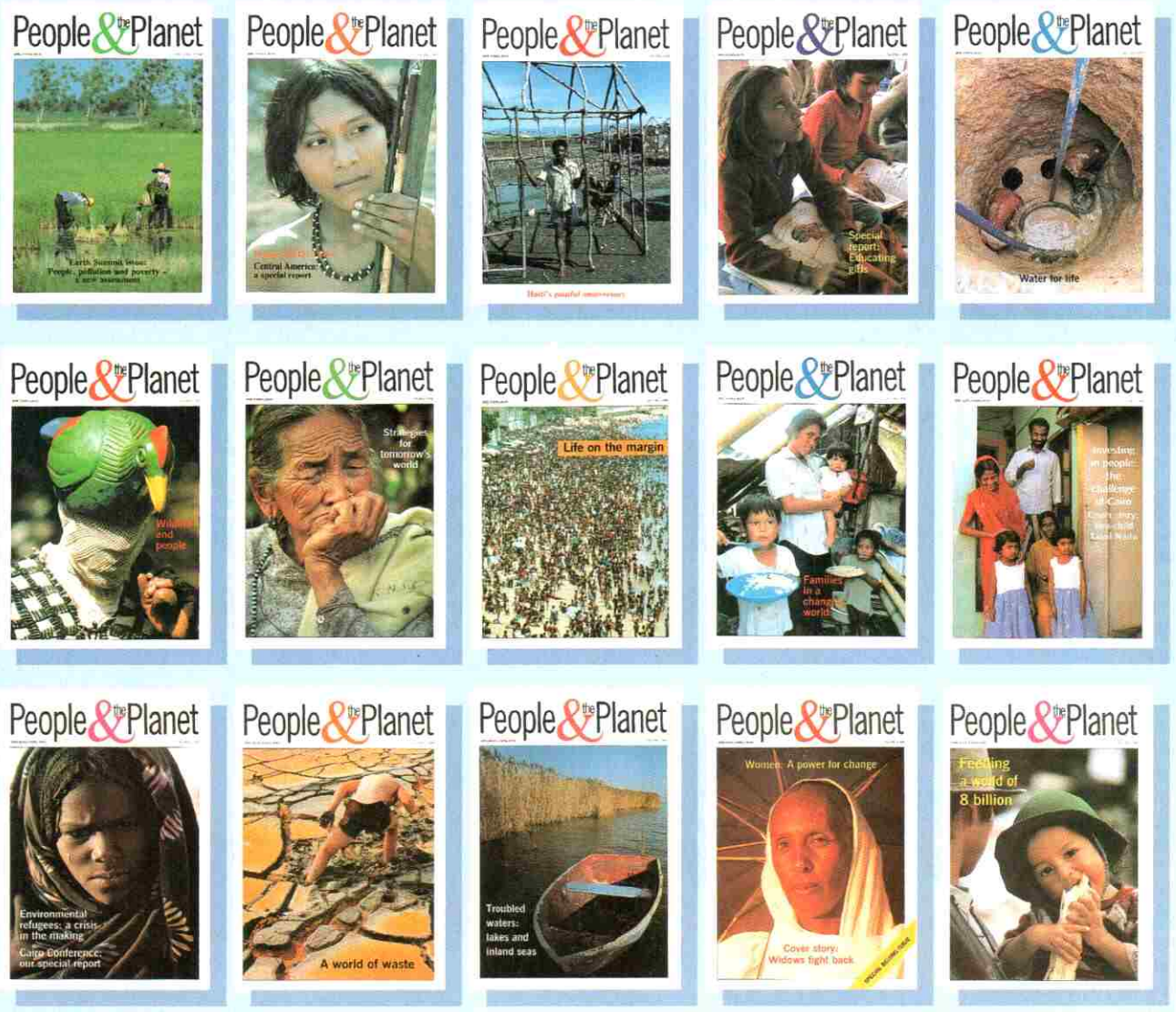
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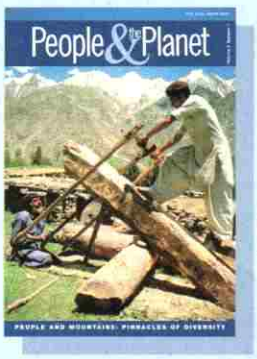

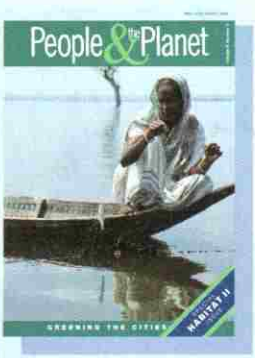

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